PATERSON GROUP

Geotechnical Investigation
Proposed Residential Development

Trails Edge East – Renaud Road
Ottawa, Ontario

Prepared for Richcraft Homes

Report PG0861-3 Revision 5 dated August 12, 2022

Table of Contents

PAGE

Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Richcraft Homes (Richcraft) to conduct a geotechnical investigation for the proposed Trails Edge East residential development, to be located along Renaud Road in the City of Ottawa (refer to Figure 1 - Key Plan presented in Appendix 2).

The objectives of the geotechnical investigation were to:

- determine the subsoil and groundwater conditions at this site by means of test holes.
- provide geotechnical recommendations for the design of the proposed development including construction considerations which may affect its design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

Investigating the presence or potential presence of contamination on the subject property was not part of the scope of work of this present investigation. Therefore, the present report does not address environmental issues.

2.0 Proposed Development

It is understood that the proposed development will consist of residential dwellings, parking areas, local roadways and parkland areas. It is further understood that the development will be fully municipally serviced once completed.

The subject site is located at the northwest corner of Renaud Road and Mer Bleue Road.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the investigation was carried out on October 14, 15, 16 and 24, 2008. At that time, ten (10) boreholes and ten (10) test pits were completed across the subject site. The test hole locations were distributed across the site in a manner to provide general coverage of the subject site. The locations of the test holes are shown on Drawing PG0861-6 - Test Hole Location Plan included in Appendix 2.

Eleven (11) additional boreholes were drilled on May 8, 9 and 10, 2017 within the east portion of the site. A supplementary soils review was also carried out on July 10, 2018 which included nineteen (19) additional test pits across the subject site.

The boreholes were put down using a track-mounted auger drill rig operated by a two-person crew. The test pits were excavated using a rubber-tired backhoe. All fieldwork was conducted under the full-time supervision of personnel from Paterson's geotechnical division under the direction of a senior engineer. The testing procedure consisted of either augering or excavating to the required depths and at the selected locations and sampling the overburden.

Sampling and In Situ Testing

Soil samples were collected from the boreholes using a 50 mm diameter split-spoon (SS) sampler, using 73 mm diameter thin walled (TW) Shelby tubes in conjunction with a piston sampler, or the auger flights and as grab samples from the sidewalls of the test pits. All soil samples were visually inspected and initially classified on site. The split-spoon samples were placed in sealed plastic bags and the Shelby tubes were sealed at both ends on site. All samples were transported to our laboratory for further examination and classification. The depths at which the split-spoon, Shelby tube, auger and grab samples were recovered from the test holes are shown as SS, TW, AU and G, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1.

The Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples. The SPT results are recorded as "N" values on the Soil Profile and Test Data sheets. The "N" value is the number of blows required to drive the split-spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

The thickness of the silty clay layer was evaluated during the course of the investigation by a dynamic cone penetration test (DCPT) at BH 12-08 and BH 17-08. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at its tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

Undrained shear strength testing was carried out in cohesive soils using a field vane apparatus.

The subsurface conditions observed in the test holes were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets in Appendix 1 of this report.

Groundwater

Flexible standpipes were installed in all boreholes to permit monitoring of the groundwater levels subsequent to the completion of the sampling program. Groundwater infiltration levels were noted at the time of excavation at the test pit locations.

Sample Storage

All samples will be stored in the laboratory for a period of one month after issuance of this report. They will then be discarded unless we are otherwise directed.

3.2 Field Survey

The test hole locations were selected by Paterson personnel to provide general coverage of the site. The boreholes were located in the field by Stantec Geomatics (Stantec) and the test pits were located in the field by Paterson personnel. The ground surface elevations at the test hole locations were determined by Stantec. It is understood that the elevations are referenced to a geodetic datum.

The test hole locations and the ground surface elevation at each test hole location are presented on Drawing PG0861-6 - Test Hole Location Plan included in Appendix 2.

3.3 Laboratory Review

The soil samples recovered from the subject site were examined in our laboratory to review the results of the field logging.

A total of seven (7) Shelby tube samples were submitted for unidimensional consolidation and Atterberg limits testing.

The results of the consolidation and Atterberg limits testing are presented on the Consolidation Test and Atterberg Limits' Results sheets, respectively, presented in Appendix 1 and are further discussed in Sections 4 and 5.

Additional soil review was carried out in accordance with the City of Ottawa Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines) and included additional laboratory testing, including nineteen (19) Atterberg limits tests, six (6) grain size distribution (sieve and hydrometer analysis) and one (1) shrinkage limit test. The results are summarized in Section 4 and are further discussed in Subsection 6.8.

3.4 Analytical testing

One (1) soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was submitted to determine the concentrations of sulphate and chloride, the resistivity and the pH of the soil. The results are shown in Appendix 1 and are further discussed in Subsection 6.7.

4.0 Observations

4.1 Surface Conditions

The subject site is currently undeveloped and the original ground surface is relatively flat. However, currently the majority of the original ground surface is covered with several fill piles as part of an on-going settlement surcharge program. The majority of the fill material for the surcharge program was placed in 2015 to early 2016. However, a topsoil fill pile was originally placed in May 2011 (SP 1 to SP 9) within the south portion of the site. Additional fill material was placed over the existing topsoil pile as part of the current surcharge program in May 2015. Also, additional fill is still required for the area adjacent to several of the settlement plate locations (SP 25 to SP 28). The approximate outline of the existing surcharge fill piles are presented in Drawing PG0861-6 - Test Hole Location Plan in Appendix 2.

4.2 Subsurface Profile

Generally, the soil conditions encountered at the test hole locations consist of topsoil and/or a thin silty sand layer overlying a deep silty clay deposit. Practical refusal to DCPT was observed at depths of 18.9 and 23.7 m at BH 12-08 and BH 17-08, respectively. Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for specific details of the soil profiles encountered at each test hole location.

Based on available geological mapping, the bedrock in this area mostly consists of interbedded limestone and shale of the Lindsay formation with an overburden drift thickness of 25 to 50 m depth.

Silty Clay

The upper portion of the silty clay has been weathered to a brown crust at all test hole locations. Grey silty clay was encountered below the brown silty clay crust at all test hole locations. In situ shear vane field testing conducted within the grey silty clay layer yielded undrained shear strength values ranging from 15 to 55 kPa. These values are indicative of a very soft to stiff consistency.

Six (6) silty clay samples collected at this site were subjected to unidimensional consolidation testing. The results are presented in Appendix 1, and summarized in Table 5 in Subsection 5.3. The results indicate that the silty clay is overconsolidated with overconsolidation ratios varying between 1.6 and 3.3. The natural water content of grey silty clay ranged from 72 to 96%.

Atterberg limits testing was completed on the recovered silty clay samples at selected locations throughout the subject site and associated moisture contents on the submitted soil samples. The results of Atterberg Limits tests conducted on samples of silty clay are presented in Table 1 and on the Atterberg Limits Results sheets in Appendix 1. The tested silty clay samples classify as inorganic clays of low plasticity (CL) and high plasticity (CH) in accordance with the Unified Soil Classification System.

Table 1 – Atterberg Limits Results

Sample	Depth (m)	LL (%)	PL (%)	PI (%)	w (%)	Classification
BH 15-08 TW2	4.91	66	28	38	84	CH
BH 17-08 TW2	4.11	77	29	48	96	CH
TP 1-18	0.48	72	18	54	34	CH
TP 2-18	0.59	62	24	38	38	CH
TP 3-18	0.76	63	22	41	44	CH
TP 4-18	1.14	66	21	44	38	CH
TP 5-18	4.19	72	20	52	39	CH
TP 6-18	3.68	66	20	46	37	CH
TP 7-18	0.49	65	23	42	46	CH
TP 8-18	3.55	62	19	43	34	CH
TP 9-18	1.25	68	22	46	44	CH
TP 10-18	0.72	76	20	55	44	CH
TP 11-18	0.73	68	19	49	40	CH
TP 12-18	1.52	66	21	45	38	CH
TP 13-18	2.7	48	16	32	29	CH
TP 14-18	1.35	66	22	43	41	CH
TP 15-18	3.72	70	21	48	32	CH
TP 16-18	4.18	52	19	33	44	CH
TP 17-18	1.3	77	20	57	34	CH
TP 18-18	0.5	64	23	41	48	CH
TP 19-18	0.52	62	22	40	46	CH

Note: LL: Liquid Limit; PL: Plastic Limit; PI: Plasticity Index; w: water content;
CL: Clay of Low Plasticity; CH: Clay of High Plasticity

The results of the shrinkage limit test indicate a shrinkage limit of 20% and a shrinkage ratio of 1.76.

Grain size distribution (sieve and hydrometer analysis) was also completed on six (6) selected samples. The results of the grain size analysis are presented in Table 2 below and on the Grain Size Distribution Results sheets in Appendix 1.

Table 2 – Summary of Grain Size Distribution Analysis

Test Hole	Sample	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
TP 2-18	G1	0	1.4	29.1	69.5
TP 7-18	G1	0	0.7	24.8	74.5
TP 10-18	G1	0	0.2	21.3	78.5
TP 12-18	G1	0	1.1	23.9	75.0
TP 17-18	G1	0	1.5	29.0	69.5
TP 19-18	G1	0	0.3	22.2	77.5

4.3 Groundwater

The measured groundwater levels in the boreholes and the open hole groundwater levels observed in the test pits are presented in Table 3. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater level could vary at the time of construction.

Table 3 - Summary of Groundwater Level Readings

Test Hole Number	Ground Surface Elevation (m)	Groundwater Level (m)	Groundwater Elevation (m)	Recording Date
BH 12-08	87.62	5.60	82.02	October 23, 2008
BH 13-08	87.38	6.30	81.08	October 23, 2008
BH 14-08	87.03	1.45	85.58	October 23, 2008
BH 15-08	87.24	6.10	81.14	October 23, 2008
BH 16-08	86.88	3.20	83.68	October 23, 2008
BH 17-08	87.41	0.45	86.96	October 23, 2008
BH 18-08	87.29	0.75	86.54	October 23, 2008
BH 19-08	86.80	0.80	86.00	October 23, 2008

Table 3 (Continued) - Summary of Groundwater Level Readings				
Test Hole Number	**Ground Surface Elevation (m)**	**Groundwater Level (m)**	**Groundwater Elevation (m)**	**Recording Date**
BH 21-08	87.02	5.50	81.52	October 23, 2008
TP 17-08	87.62	Dry	-	October 24, 2008
TP 18-08	87.38	1.50	85.88	October 24, 2008
TP 19-08	87.03	1.60	85.43	October 24, 2008
TP 20-08	87.24	3.00	84.24	October 24, 2008
TP 21-08	86.88	2.30	84.58	October 24, 2008
TP 22-08	87.41	1.20	86.21	October 24, 2008
TP 23-08	87.29	1.50	85.79	October 24, 2008
TP 24-08	86.80	1.30	85.50	October 24, 2008
TP 25-08	87.11	1.00	86.11	October 24, 2008
TP 26-08	87.02	2.90	84.12	October 24, 2008

5.0 Discussion

5.1 Geotechnical Assessment

Generally, the subject site is acceptable from geotechnical perspective for the proposed residential development. Due to the presence of the sensitive silty clay layer, the subject site will be subjected to grade raise restrictions. Based on the finished grading currently proposed for the subject site, a settlement surcharge monitoring program has been designed for the subject phases. The settlement surcharge program was designed to eliminate the excessive settlement anticipated due to the proposed grading and the underlying silty clay deposit.

A settlement surcharge program has been completed for Phase 1 and the majority of Phases 2 and 3, and these areas are outlined on Drawing PG0861-6 - Test Hole Location Plan in Appendix 2. A detailed grading summary (Paterson Group Memo PG0861-MEMO.43 dated July 29, 2021) has been provided on a lot by lot basis. Any lots/blocks requiring lightweight fill due to grading exceedances are detailed in the summary table, which has been issued as part of the Sensitive Soil Protocol required by the City of Ottawa Building Permit department.

Several lots/blocks within the central portion of Phase 2, for which a surcharge settlement program has been completed, will require lightweight fill due to the minimal surcharge heights observed within areas of this overall surcharge pile. The specific details for the lightweight fill for these areas are outlined in our detailed grading summary table, as previously noted.

The periodic monitoring results from our settlement monitoring program to date are presented in Figures 2 through 5 - Settlement Surcharge Monitoring Program in Appendix 2.

The above and other considerations are further discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing organic materials, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures.

Fill Placement

Fill used for grading beneath the building areas should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site. The fill should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building areas should be compacted to at least 98% of its standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil can be used as general landscaping fill and beneath parking areas where settlement of the ground surface is of minor concern. In landscaped areas, these materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If these materials are to be used to build up the subgrade level for areas to be paved, they should be compacted in thin lifts to a minimum density of 95% of their respective SPMDD. Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

5.3 Foundation Design

Based on the results of the geotechnical investigation, lightly loaded structures, such as the residential buildings anticipated, could be founded on shallow footings bearing on stiff brown silty clay crust.

Bearing Resistance Values

Based on the subsurface profile encountered, it is expected that stiff silty clay will be encountered at the founding levels of the proposed structures.

Using continuously applied loads, strip footings, up to 2 m wide, and pad footings, up to 4 m wide, placed on an undisturbed, stiff silty clay bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **100 kPa** and a factored bearing resistance values at ultimate limit states (ULS) of **200 kPa**.

An undisturbed soil bearing surface consists of one from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Bearing resistance values for footing designs should be determined on a lot per lot basis at the time of construction.

Settlement/Grade Raise

Consideration must also be given to potential settlements which could occur due to the presence of the silty clay deposit and the combined loads from the proposed footings, any groundwater lowering effects, and grade raise fill. The foundation loads to be considered for the settlement case are the continuously applied loads which consist of the unfactored dead loads and the portion of the unfactored live load that is considered to be continuously applied. For dwellings, a minimum value of 50% of the live load is often recommended by Paterson.

Generally, the potential long-term settlement is evaluated based on the compressibility characteristics of the silty clay. These characteristics are estimated in the laboratory by conducting unidimensional consolidation tests on undisturbed soil samples collected using Shelby tubes in conjunction with a piston sampler. Seven (7) site specific consolidation tests were carried out for this project. The results of the consolidation tests are presented in Table 4 on the following page and in Appendix 1.

Value p'_c is the preconsolidation pressure of the sample and p'_o is the effective overburden pressure. The difference between these values is the available preconsolidation. The increase in stress on the soil due to the cumulative effects of the fill surcharge, the footing pressures, the slab loadings and the lowering of the groundwater should not exceed the available preconsolidation if unacceptable settlements are to be avoided.

The values C_{cr} and C_c are the recompression and compression indices, respectively, and are a measure of the compressibility of the soil due to stress increases below and above the preconsolidation pressures. The higher values for the Cc, as compared to the C_{cr}, illustrate the increased settlement potential above, as compared to below, the preconsolidation pressure.

Table 4 – Consolidation Results

Borehole No.	Sample	Depth	P'_C (kPa)	P'_O (kPa)	C_{CR}	C_C	Q (*)
BH 3	TW 3	3.48	145	47	0.048	2.478	A
BH 3	TW 5	6.53	103	64	0.043	2.967	A
BH 3	TW 7	9.6	175	82	0.028	3.046	A
BH 12-08	TW 4	9.4	109	68	0.031	3.080	A
BH 13-08	TW 2	3.42	142	43	0.025	1.334	A
BH 15-08	TW 2	4.91	87	50	0.028	1.890	A
BH 17-08	TW 3	4.11	100	42	0.034	3.750	A
BH 19-08	TW 3	4.9	99	43	0.026	3.100	A
BH 21-08	TW 4	4.19	89	50	0.041	3.172	A

Q - Quality assessment of sample - G: Good A: Acceptable P: Likely disturbed

It should be noted that the values of p'_c, p'_o, C_{cr} and C_c are determined using standard engineering practices and are estimates only. In addition, natural variations within the soil deposit would also affect the results. Furthermore, the p'_o parameter is directly influenced by the groundwater level. While the groundwater levels were measured at the time of the fieldwork, the levels vary with time, and this has an impact on the available preconsolidation. Lowering the groundwater level increases the p'_o and therefore reduces the available preconsolidation. Unacceptable settlements could be induced by a significant lowering of the groundwater level. The long-term groundwater table was used to determine the p'_o parameter, which was determined at each borehole location based on the colouring and moisture levels of the recovered soil samples and undrained shear strength profile of the silty clay.

To reduce potential long term liabilities, it is recommended to reduce long term groundwater lowering (e.g. clay dykes, restriction on planting around the dwellings, etc). It should be noted that building on silty clay deposits increases the likelihood of building movements and therefore of cracking. The use of steel reinforcement in foundations placed at key structural locations will tend to reduce foundation cracking as compared to unreinforced foundations.

For building design purposes, the total and differential settlements are estimated to be 25 and 20 mm, respectively. A post-development groundwater lowering of 0.5 m was assumed for our permissible grade raise calculations.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to a stiff to firm silty clay above the groundwater table when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

Bedrock/Soil Transition

Where a building is founded partly on bedrock and partly on soil, it is recommended to decrease the soil bearing resistance value by 25% for the footings placed on soil bearing media to reduce the potential long-term total and differential settlements. Also, at the soil/bedrock and bedrock/soil transitions, it is recommended that the upper 0.5 m of the bedrock be removed for a minimum length of 2 m (on the bedrock side) and replaced with nominally compacted OPSS Granular A or Granular B Type II material.

The width of the sub-excavation should be at least the proposed footing width plus 0.5 m. Steel reinforcement, extending at least 3 m on both sides of the 2 m long transition, should be placed in the top part of the footings and foundation walls.

5.4 Settlement Surcharge Monitoring Program

Based on our current settlement survey information and existing soils information, a permissible grade raise restriction of 1.4 m is recommended for housing and a permissible grade raise of 1.7 m is recommended for roadways, where a settlement surcharge program is not planned, completed or currently underway. It is expected that any roadways in exceedance of our permissible grade raise recommendations will be surcharged. However, lightweight fill can be used for the buildings for raising the grade without adding a significant load to the underlying soils.

A settlement surcharge monitoring program was completed for Phase 1 and portions of Phases 2 and 3. The lightweight fill recommendations for Phases 2 and 3 have been updated based on the results of the settlement surcharge monitoring programs.

Settlement monitoring data showing cumulative settlement over the course of the surcharge program for Phases 1, 2 and 3 is presented in Figure 2 to Figure 5 in Appendix 2. The surcharge pile locations are shown on Drawing PG0861-6 - Test Hole Location Plan in Appendix 2.

5.5 Design for Earthquakes

The proposed site can be taken as seismic site response Class E as defined in the Ontario Building Code 2012 (OBC 2012; Table 4.1.8.4.A) for shallow foundations considered at this site. The soils underlying the site are not susceptible to liquefaction.

5.6 Basement Floor Slab

With the removal of all topsoil and fill containing organic matter within the footprints of the proposed buildings, the undisturbed native soil surface will be considered to be an acceptable subgrade on which to commence backfilling for floor slab construction. Any soft areas should be removed and backfilled with appropriate backfill material. OPSS Granular B Type I or II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. It is recommended that the upper 200 mm of sub-slab fill consist of 19 mm clear crushed stone.

5.6 Pavement Structure

For design purposes, the pavement structure presented in the following tables could be used for the design of driveways and local residential streets. It should be noted that for residential driveways and car only parking areas, an Ontario Traffic Category A is applicable. For local roadways, an Ontario Traffic Category B should be used for design purposes.

Table 5 - Recommended Pavement Structure - Driveways

Thickness (mm)	Material Description
50	**Wear Course** – HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
300	**SUBBASE** – OPSS Granular B Type II
SUBGRADE - Either in situ soils, bedrock or OPSS Granular B Type I or II material placed over in situ soil or bedrock	

Table 6 - Recommended Pavement Structure – Local Residential Roadways	
Thickness (mm)	**Material Description**
40	**Wear Course** – HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course** – HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
400	**SUBBASE** – OPSS Granular B Type II
SUBGRADE - Either in situ soils, bedrock or OPSS Granular B Type I or II material placed over in situ soil or bedrock	

Table 7 - Recommended Pavement Structure – Roadways with Bus Traffic	
Thickness (mm)	**Material Description**
40	**Wear Course** – Superpave 12.5 Asphaltic Concrete
50	**Upper Binder Course** – Superpave 19.0 Asphaltic Concrete
50	**Lower Binder Course** – Superpave 19.0 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
600	**SUBBASE** – OPSS Granular B Type II
SUBGRADE - Either in situ soils, bedrock or OPSS Granular B Type I or II material placed over in situ soil or bedrock	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material. Weak subgrade conditions may be experienced over service trench fill materials. This may require the use of a geotextile, thicker subbase or other measures that can be recommended at the time of construction as part of the field observation program.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable vibratory equipment. It is recommended that a compaction level between 91% and 96.5% be provided for Superpave 19.0. A compaction level between 92% to 97.5% be provided for Superpave 12.5.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on keeping the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing its load carrying capacity.

Due to the impervious nature of the subgrade materials consideration should be given to installing subdrains during the pavement construction. These drains should be installed at each catch basin, be at least 3 m long and should extend in four orthogonal directions or longitudinally when placed along a curb. Along local streets, the drains should be placed along the edges of the pavement. The subdrain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be crowned to promote water flow to the drainage lines.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

It is recommended that a perimeter foundation drainage system be provided for proposed structures. The system should consist of a 100 to 150 mm diameter, geotextile-wrapped, perforated, corrugated, plastic pipe, surrounded on all sides by 150 mm of 19 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Backfill against the exterior sides of the foundation walls should consist of free-draining, non frost susceptible granular materials. The site materials will be frost susceptible and, as such, are not recommended for re-use as backfill unless a composite drainage system (such as system Platon or Miradrain G100N) connected to a drainage system is provided.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum 1.5 m thick soil cover (or equivalent) should be provided in this regard.

A minimum of 2.1 m thick soil cover (or equivalent) should be provided for other exterior unheated footings.

6.3 Excavation Side Slopes

The excavation for the proposed development will be mostly through silty clay. Above the groundwater level, for excavations to depths of approximately 3 m, the excavation side slopes should be stable in the short term at 1H:1V. The lowermost 1.2 m can be vertical provided the material consists of stiff in situ silty clay. Flatter slopes could be required for deeper excavations or for excavation below the groundwater level. Where such side slopes are not permissible or practical, temporary shoring should be used. The subsoil at this site is considered to be mainly a Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

The slope cross-sections recommended above are for temporary slopes. Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by "cut and cover" methods and excavations will not be left open for extended periods of time.

It is expected that deep service trenches in excess of 3 m will be completed using a temporary shoring system designed by a structural engineer, such as stacked trench boxes in conjunction with steel plates. The trench boxes should be installed to ensure that the excavation sidewalls are tight to the outside of the trench boxes and that the steel plates are extended below the base of the excavation to prevent basal heave (if required).

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

Excavation Base Stability

The base of supported excavations can fail by three (3) general modes:

- ❑ Shear failure within the ground caused by inadequate resistance to loads imposed by grade difference inside and outside of the excavation,
- ❑ Piping from water seepage through granular soils, and
- ❑ Heave of layered soils due to water pressures confined by intervening low permeability soils.

Shear failure of excavation bases is typically rare in granular soils if adequate lateral support is provided. Inadequate dewatering can cause instability in excavations made through granular or layered soils. The potential for base heave in cohesive soils should be determined for stability of flexible retaining systems.

The factor of safety with respect to base heave, FS_b, is:

$$FS_b = N_b s_u / \sigma_z$$

where:

N_b - stability factor dependent upon the geometry of the excavation and given in Figure 1 on the following page.
s_u - undrained shear strength of the soil below the base level
σ_z - total overburden and surcharge pressures at the bottom of the excavation

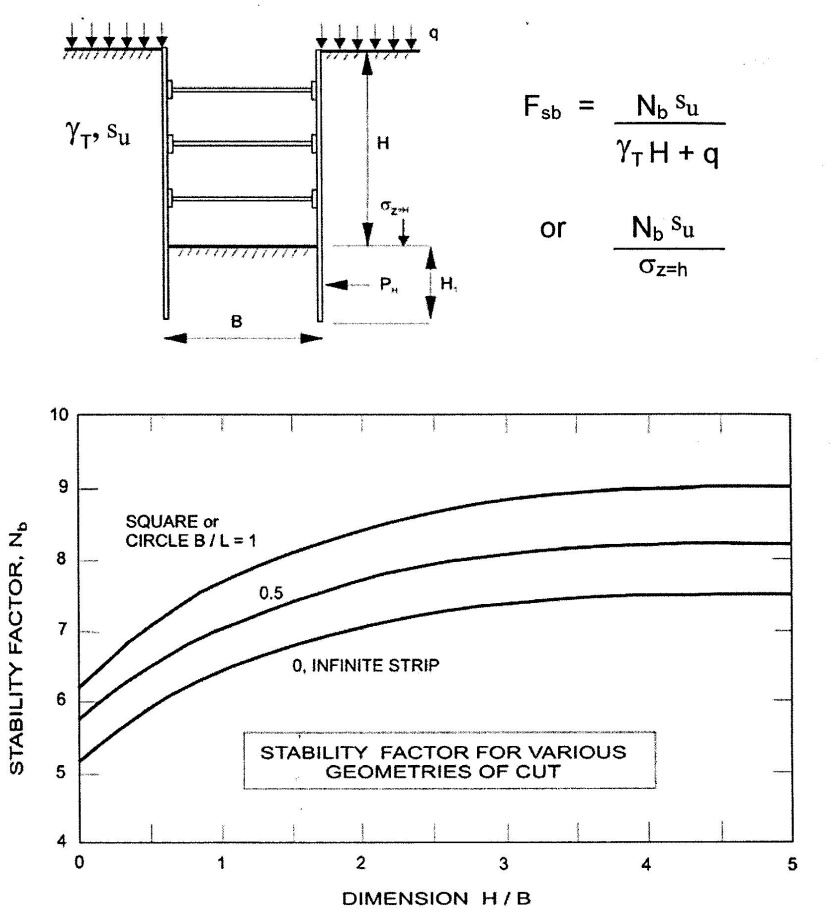

Figure 1 - Stability Factor for Various Geometries of Cut

In the case of soft to firm clays, a factor of safety of 2 is recommended for base stability.

6.4 Pipe Bedding and Backfill

The pipe bedding for sewer and water pipes should consist of at least 150 mm of OPSS Granular A material. Where the bedding is located within the soft to firm grey silty clay, the thickness of the bedding material should be increased to a minimum of 300 mm. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of its SPMDD. The bedding material should extent at least to the spring line of the pipe.

The cover material, which should consist of OPSS Granular A, should extend from the spring line of the pipe to at least 300 mm above the obvert of the pipe. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of its SPMDD.

It should generally be possible to re-use the moist (not wet) brown silty clay above the cover material if the excavation and filling operations are carried out in dry weather conditions. Wet silty clay materials will be difficult to re-use, as the high-water contents make compacting impractical without an extensive drying period.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD.

To reduce long-term lowering of the groundwater level at this site, clay seals should be provided in the service trenches. The clay seals should be as per Standard Drawing No. S8 of the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa. The seals should be at least 1.5 m long (in the trench direction), as compared to the 1 m minimum in the detail, and should extend from trench wall to trench wall. Generally, the seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material. The barriers should consist of relatively dry and compactable brown silty clay placed in maximum 225 mm thick loose layers and compacted to a minimum of 95% of the material's SPMDD.
The clay seals should be placed at the site boundaries and at strategic locations at no more than 60 m intervals in the service trenches.

6.5 Groundwater Control

It is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

A temporary Ministry of the Environment, Conservation, and Parks (MECP) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MECP.

For typical ground or surface water volumes, being pumped during the construction phase, between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR).

A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MOECC review of the PTTW application

6.6 Winter Construction

The subsoil conditions at this site mostly consist of frost susceptible materials. In presence of water and freezing conditions ice could form within the soil mass. Heaving and settlement upon thawing could occur. Precautions should be taken if winter construction is considered for this project.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

The trench excavations should be carried out in a manner that will avoid the introduction of frozen materials into the trenches. As well, pavement construction is difficult during winter. The subgrade consists of frost susceptible soils which will experience total and differential frost heaving as the work takes place. In addition, the introduction of frost, snow or ice into the pavement materials, which is difficult to avoid, could adversely affect the performance of the pavement structure. Additional information could be provided, if required.

6.7 Corrosion Potential and Sulphate

The results of analytical testing indicate that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (normal cement) would be appropriate for this site. The chloride content and the pH of the sample indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of an aggressive corrosive environment.

6.8 Landscaping Considerations

Tree Planting Restrictions

In accordance with the City of Ottawa Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines), Paterson completed a soils review of the site to determine applicable tree planting setbacks. Atterberg limits testing was completed for recovered silty clay samples at selected locations throughout the subject site. Sieve analysis testing was also completed on selected soil samples. The abovenoted test results were completed between design underside of footing elevation and a 3.5 m depth below finished grade. The results of our testing are presented in Table 1 in Subsection 4.1 and in Appendix 1.

Based on the results of our review, the two tree planting setback areas are present within the proposed development. The two areas are detailed below and have been outlined in Drawing PG0861-7 - Tree Planting Setback Recommendations presented in Appendix 2.

Area 1 - Low to Medium Sensitivity Area

A low to medium sensitivity clay soil was encountered between design underside of footing elevations and 3.5 m below finished grade as per City Guidelines at the areas outlined in Drawing PG0861-7 - Tree Planting Setback Recommendations in Appendix 2. Based on our Atterberg Limits test results, the modified plasticity limit does not exceed 40% in these areas.

The following tree planting setbacks are therefore recommended for the low to medium sensitivity area. Large trees (mature height over 14 m) can be planted within these areas provided a tree to foundation setback equal to the full mature height of the tree can be provided (e.g. in a park or other green space). Tree planting setback limits may be reduced to 4.5 m for small (mature tree height up to 7.5m) and medium size trees (mature tree height 7.5 m to 14 m) provided that the conditions noted below are met:

- ❑ The underside of footing (USF) is 2.1 m or greater below the lowest finished grade must be satisfied for footings within 10 m from the tree, as measured from the centre of the tree trunk and verified by means of the Grading Plan.

- ❑ A small tree must be provided with a minimum of 25 m3 of available soil volume while a medium tree must be provided with a minimum of 30 m3 of available soil volume, as determined by the Landscape Architect. The developer is to ensure that the soil is generally un-compacted when backfilling in street tree planting locations.

- ❑ The tree species must be small (mature tree height up to 7.5 m) to medium size (mature tree height 7.5 m to 14 m) as confirmed by the Landscape Architect.

- ❑ The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall).

- ❑ Grading surround the tree must promote drainage to the tree root zone (in such a manner as not to be detrimental to the tree), as noted on the subdivision Grading Plan.

Area 1 - Low to Medium Sensitivity Area

A high sensitivity clay soil was encountered between design underside of footing elevations and 3.5 m below finished grade as per City Guidelines at the areas outlined in Drawing PG0861-7 - Tree Planting Setback Recommendations in Appendix 2. Based on our Atterberg Limits test results, the modified plasticity limit generally exceeds 40%. The following tree planting setbacks are recommended for these high sensitivity areas. Large trees (mature height over 14 m) can be planted within these provided a tree to foundation setback equal to the full mature height of the tree can be provided (e.g. in a park or other green space). Tree planting setback limits is 7.5 m for small (mature tree height up to 7.5m) provided that the following conditions are met:

- ❑ The underside of footing (USF) is 2.1 m or greater below the lowest finished grade must be satisfied for footings within 10 m from the tree, as measured from the centre of the tree trunk and verified by means of the Grading Plan.

- ❑ A small tree must be provided with a minimum of 25 m3 of available soil volume while a medium tree must be provided with a minimum of 30 m3 of available soil volume, as determined by the Landscape Architect. The developer is to ensure that the soil is generally un-compacted when backfilling in street tree planting locations.

- ❑ The tree species must be small (mature tree height up to 7.5 m) to medium size (mature tree height 7.5 m to 14 m) as confirmed by the Landscape Architect.

- ❑ The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall).

- ❑ Grading surrounds the tree must promote drainage to the tree root zone (in such a manner as not to be detrimental to the tree), as noted on the subdivision Grading Plan.

Aboveground Swimming Pools, Hot Tubs, Decks and Additions

The in-situ soils are considered to be acceptable for in-ground swimming pools. Above ground swimming pools must be placed at least 5 m away from the residence foundation and neighbouring foundations. Otherwise, pool construction is considered routine, and can be constructed in accordance with the manufacturer`s requirements.

Additional grading around the hot tub should not exceed permissible grade raises. Otherwise, hot tub construction is considered routine, and can be constructed in accordance with the manufacturer's specifications.

Additional grading around proposed deck or addition should not exceed permissible grade raises. Otherwise, standard construction practices are considered acceptable.

6.9 Retaining Walls

Several retaining walls are proposed to accommodate grade changes at the subject site. It is recommended that the retaining walls consist of segmental concrete block walls, such as the Stone Strong system, or an approved equivalent.

The proposed retaining walls should bear on an undisturbed silty clay subgrade or engineered fill which is placed directly over an undisturbed silty clay subgrade.

Detailed design drawings have been prepared by Paterson for the retaining walls within the subject site. Reference should be made to Drawings PG0861-15, PG0861-16 and PG0861-17, Revision 3 dated August 12, 2022, presented in Appendix 3.

7.0 Recommendations

It is recommended that the following be carried out once the master plan and site development are determined:

- ❑ Review master grading plan from a geotechnical perspective, once available.
- ❑ Review detailed grading plan(s) from a geotechnical perspective.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Observation of all subgrades prior to backfilling.
- ❑ Field density tests to ensure that the specified level of compaction has been achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon request, following the geotechnical consultant.

8.0 Statement of Limitations

The recommendations made in this report are in accordance with our present understanding of the project. We request permission to review the grading plan once available. Also, our recommendations should be reviewed when the drawings and specifications are complete.

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, we request that we be notified immediately in order to permit reassessment of our recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Richcraft Homes or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Owen Canton, EIT

Scott S. Dennis, P.Eng

Report Distribution:

- ❑ Richcraft Homes (email copy)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

CONSOLIDATION TEST RESULTS

ATTERBERG LIMITS RESULTS

GRAIN SIZE DISTRIBUTION SHEETS

ANALYTICAL TESTING RESULTS

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

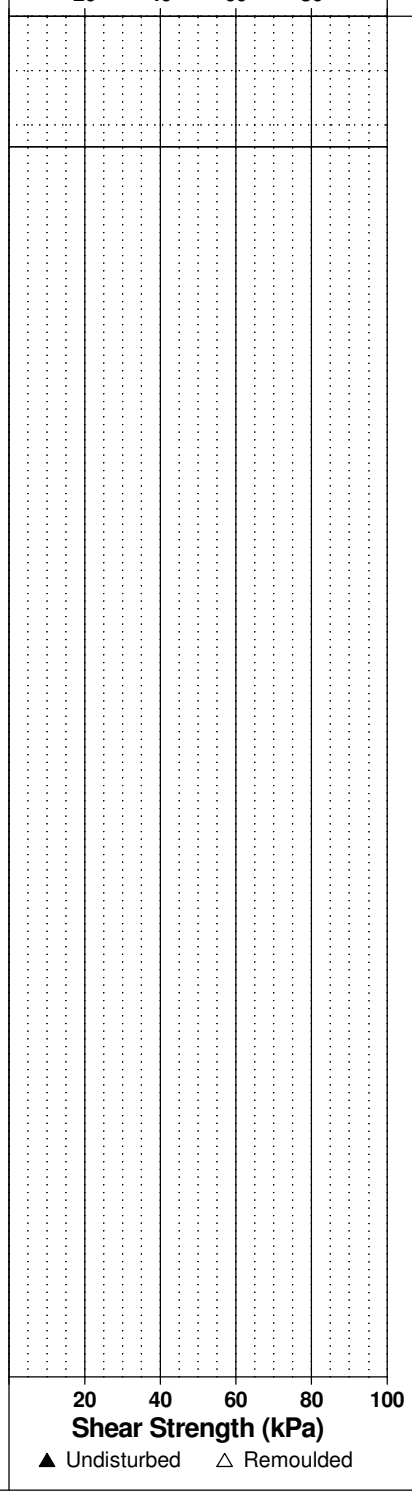
FILE NO. PG0861

REMARKS

HOLE NO. TP 1-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	86.68		
Brown **SILTY CLAY**									
0.48									
End of Test Pit									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

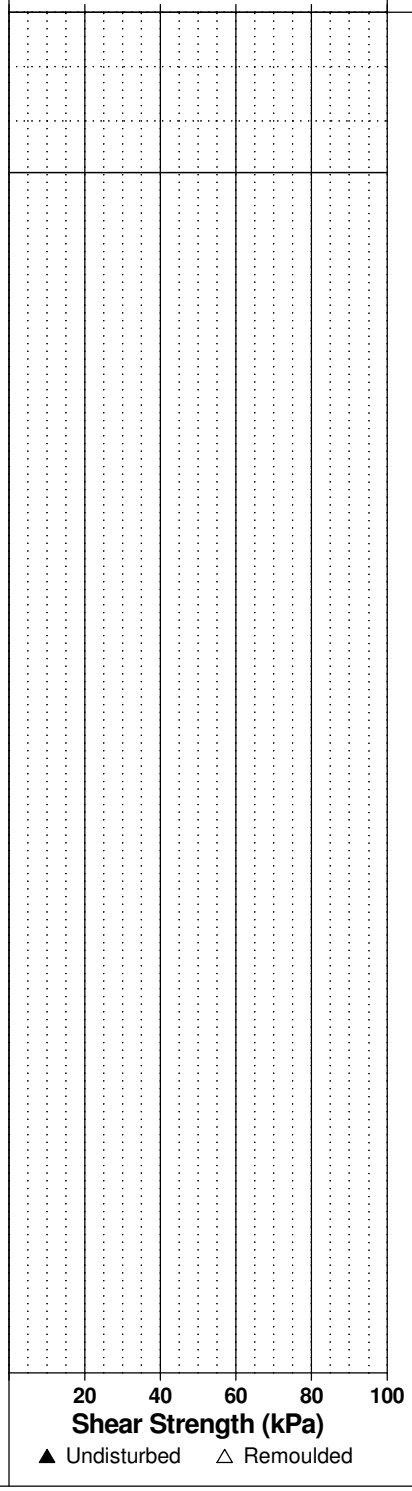
FILE NO. PG0861

REMARKS

HOLE NO. TP 2-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	86.69		
TOPSOIL 0.10									
Brown **SILTY CLAY**									
0.59									
End of Test Pit									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

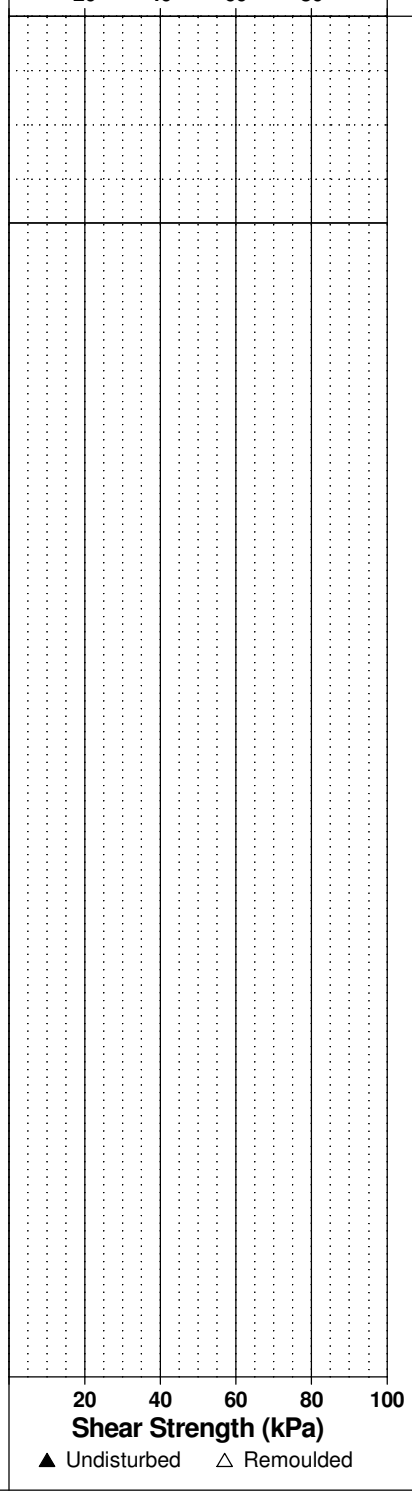
FILE NO. PG0861

REMARKS

HOLE NO. TP 3-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	86.51		
Brown **SILTY CLAY**									
						0.76			
End of Test Pit									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

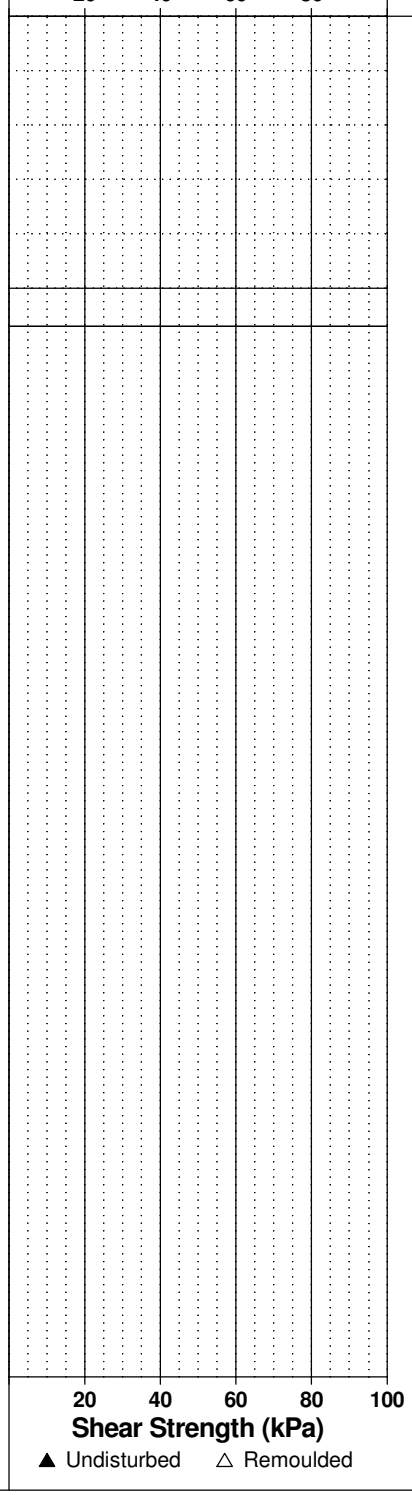
FILE NO. PG0861

REMARKS

HOLE NO. TP 4-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.44		
Brown **SILTY CLAY**						1	86.44		
1.14									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

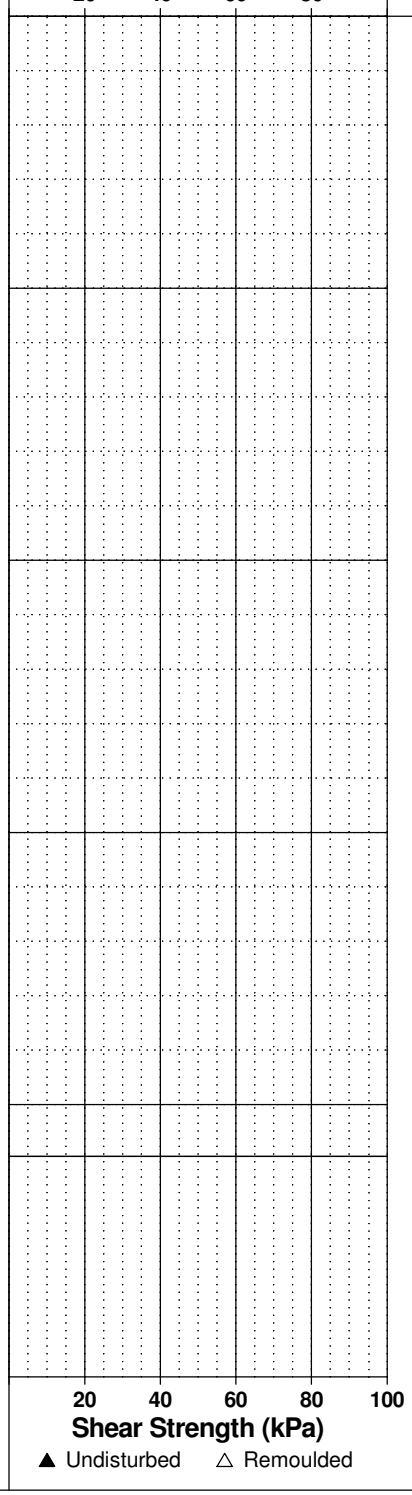
FILE NO. PG0861

REMARKS

HOLE NO. TP 5-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	90.19		
Grey **SILTY CLAY**						1	89.19		
						2	88.19		
2.39									
Brown **SILTY CLAY**						3	87.19		
						4	86.19		
4.19									
End of Test Pit									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

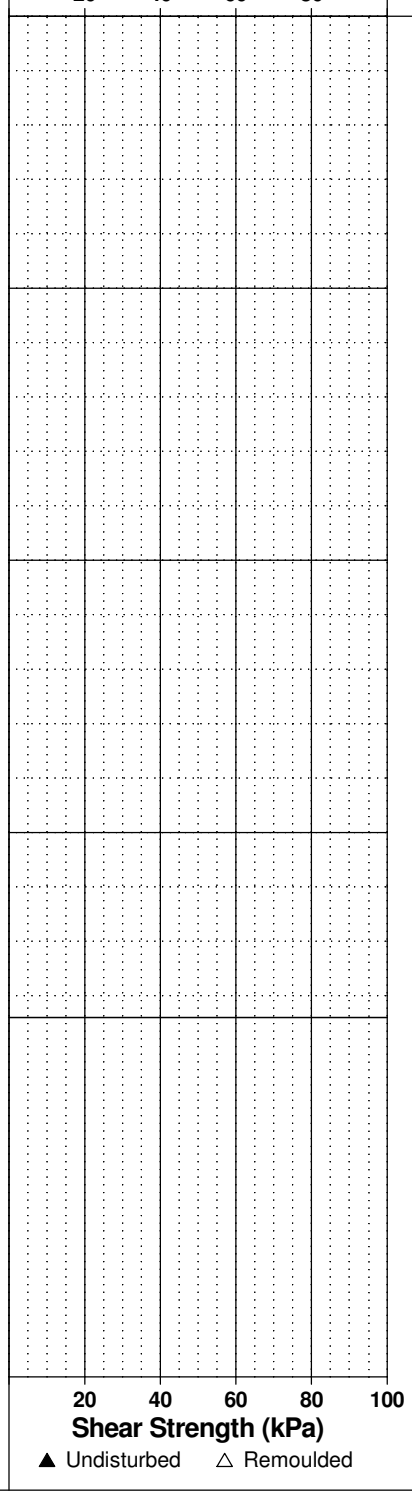
FILE NO. PG0861

REMARKS

HOLE NO. TP 6-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	89.58		
Grey **SILTY CLAY**						1	88.58		
						2	87.58		
2.28									
Brown **SILTY CLAY**						3	86.58		
3.68									
End of Test Pit									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

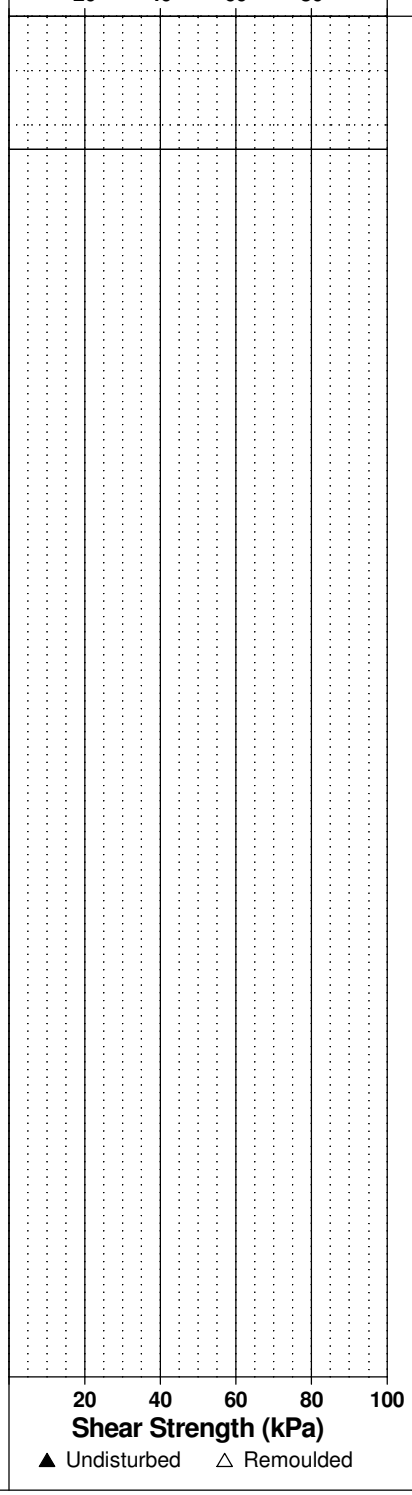
FILE NO. PG0861

REMARKS

HOLE NO. TP 7-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.29		
Brown **SILTY CLAY**									
0.49									
End of Test Pit									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

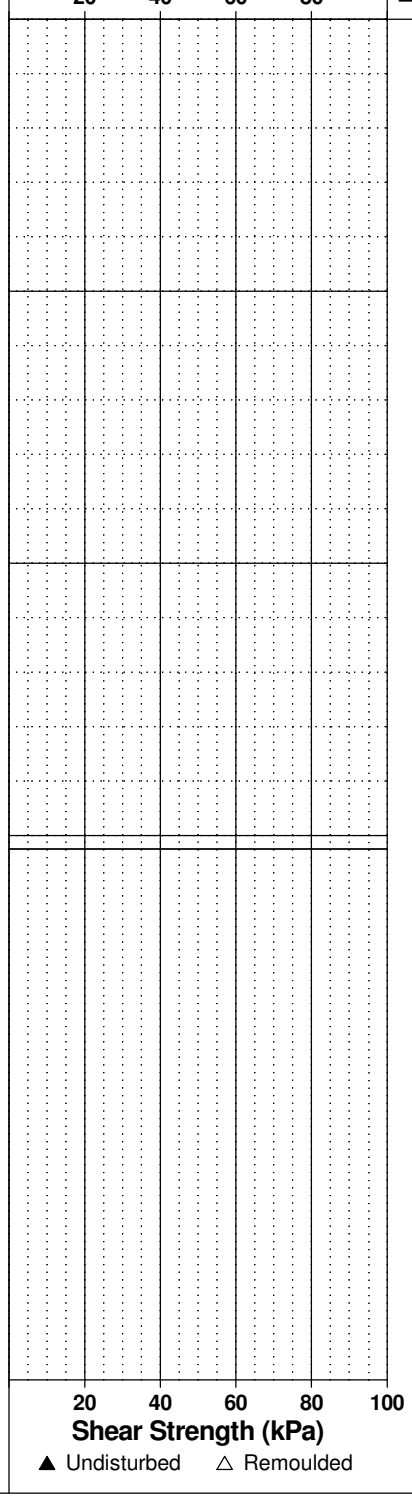
FILE NO. PG0861

REMARKS

HOLE NO. TP 8-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	89.35		
Grey **SILTY CLAY**						1	88.35		
						2	87.35		
2.65									
Brown **SILTY CLAY**						3	86.35		
3.05									
End of Test Pit									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG0861

REMARKS

HOLE NO. TP 9-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.27		
TOPSOIL 0.30									
Brown **SILTY CLAY**						1	86.27		
1.25 End of Test Pit									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

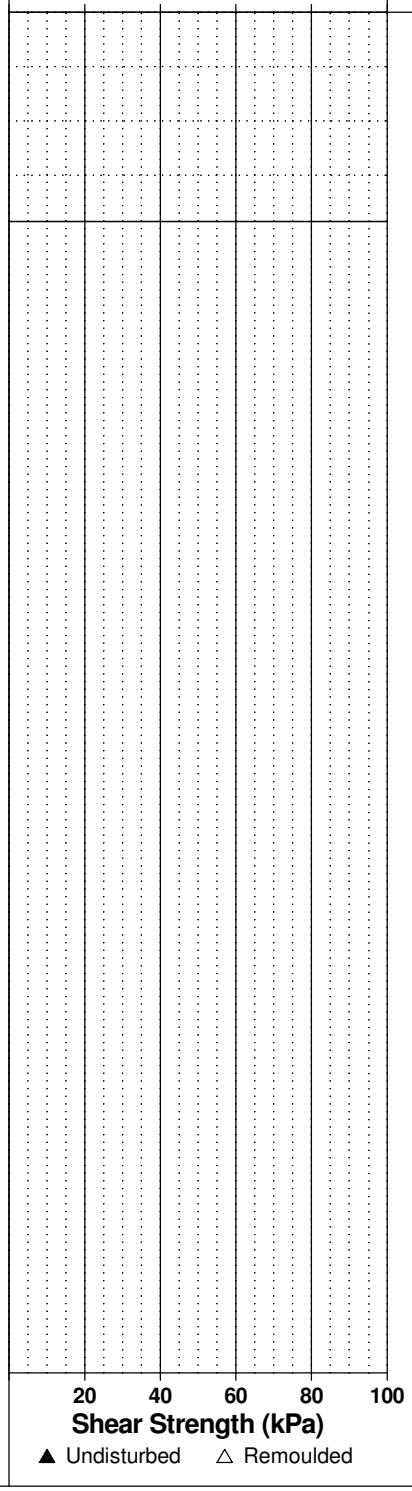
FILE NO. PG0861

REMARKS

HOLE NO. TP10-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	86.80		
Brown **SILTY CLAY**									
0.77									
End of Test Pit									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG0861

REMARKS

HOLE NO. TP11-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.43		
TOPSOIL 0.30									
Brown **SILTY CLAY** 0.73									
End of Test Pit									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %
20 40 60 80

Shear Strength (kPa)
20 40 60 80 100
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG0861

REMARKS

HOLE NO. TP12-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.02		
Brown **SILTY CLAY** surcharge									
0.85						1	87.02		
Brown **SILTY CLAY**									
1.52									
End of Test Pit									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

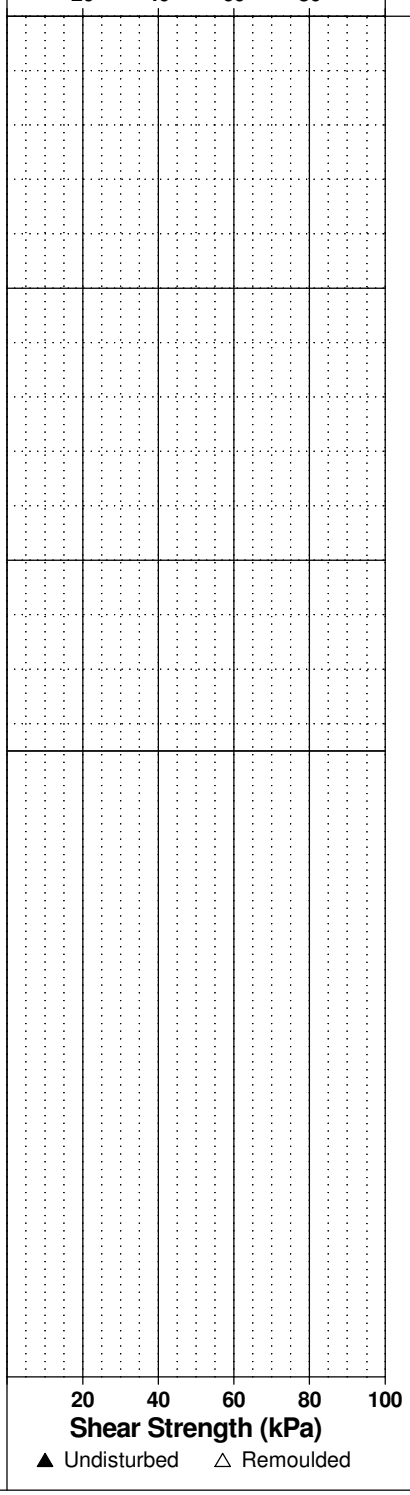
FILE NO. PG0861

REMARKS

HOLE NO. TP13-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	89.30		
Dark brown **SILTY CLAY** surcharge						1	88.30		
						2	87.30		
2.12									
Brown **SILTY CLAY**									
2.70									
End of Test Pit									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG0861

REMARKS

HOLE NO. TP14-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.05		
Brown **SILTY CLAY**						1	87.05		
1.35									
End of Test Pit									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG0861

REMARKS

HOLE NO. TP15-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	90.42		
Brown **SILTY CLAY** surcharge						1	89.42		
						2	88.42		
2.82									
Grey **SILTY CLAY**						3	87.42		
3.72									
End of Test Pit									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

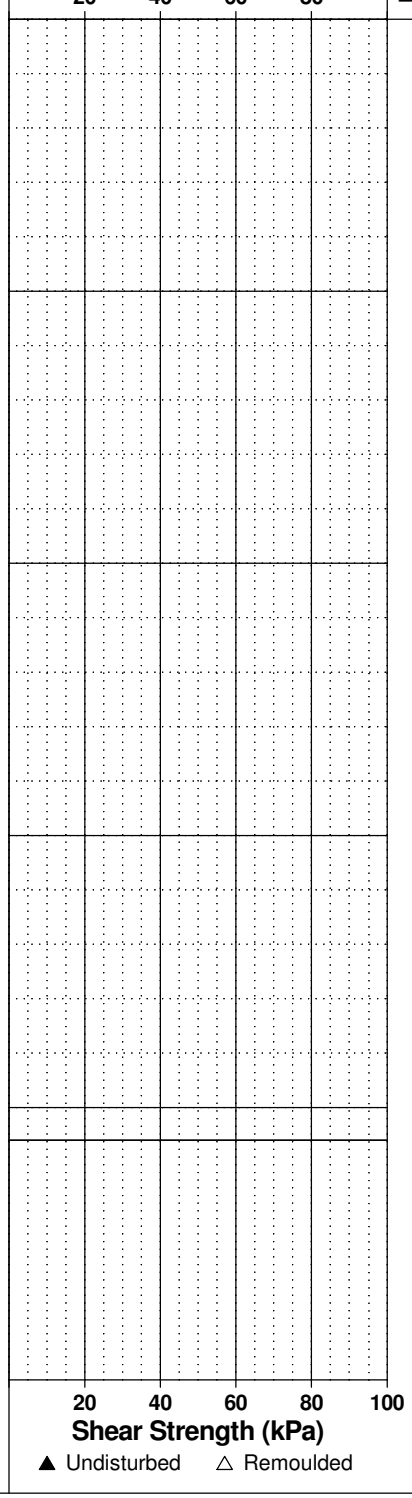
FILE NO. PG0861

REMARKS

HOLE NO. TP16-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	90.88		
Grey **SILTY CLAY** surcharge						1	89.88		
1.91						2	88.88		
Brown **SILTY CLAY**						3	87.88		
4.12						4	86.88		
End of Test Pit									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

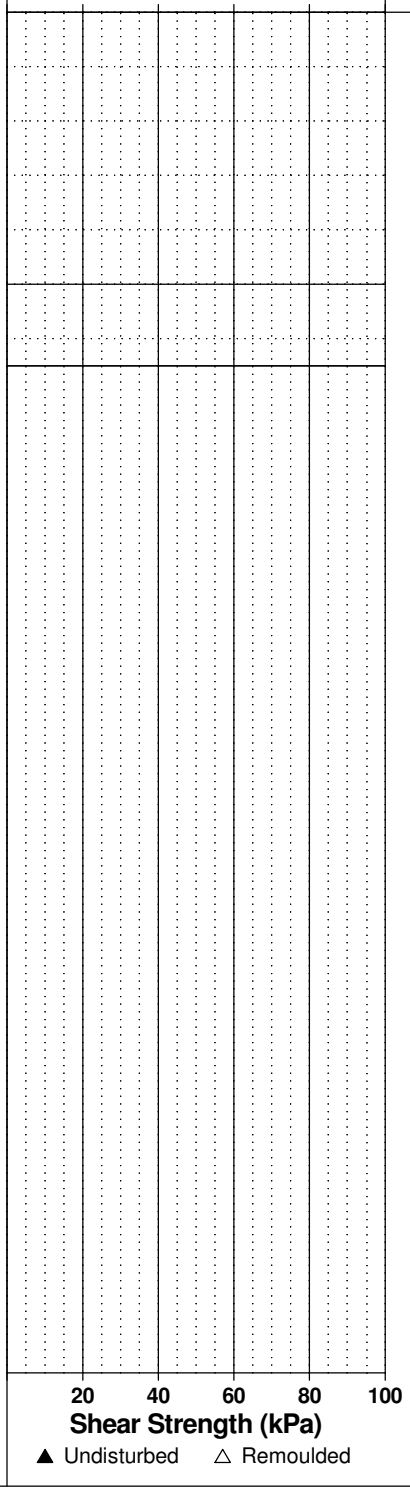
FILE NO. PG0861

REMARKS

HOLE NO. TP17-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	88.20		
TOPSOIL									
0.90									
Brown **SILTY CLAY**						1	87.20		
1.30									
End of Test Pit									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

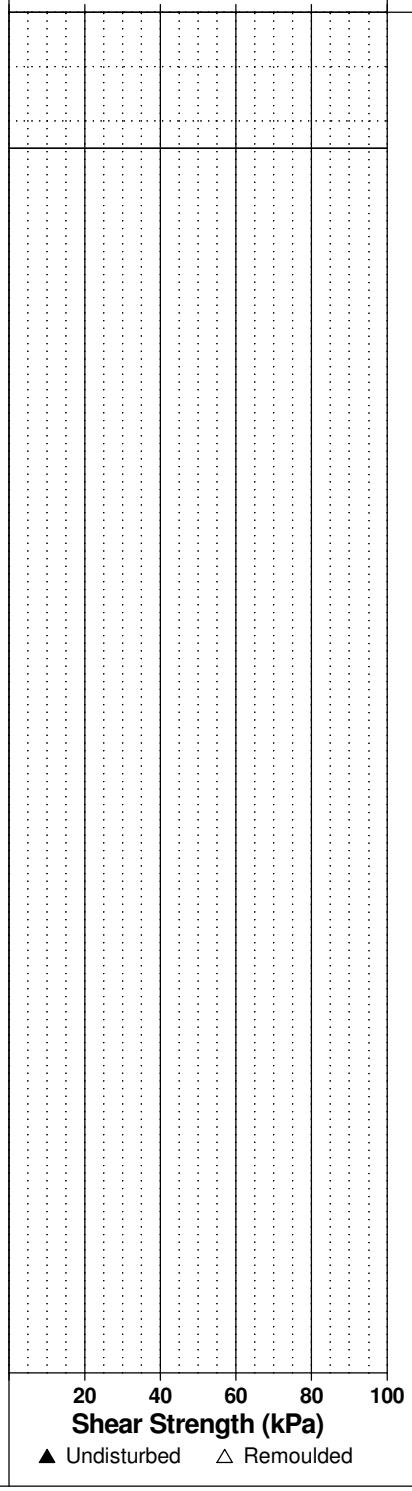
FILE NO. PG0861

REMARKS

HOLE NO. TP18-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	86.80		
Brown **SILTY CLAY**									
0.50									
End of Test Pit									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Trails Edge East Residential Development - Renaud Road
Ottawa, Ontario

DATUM Geodetic

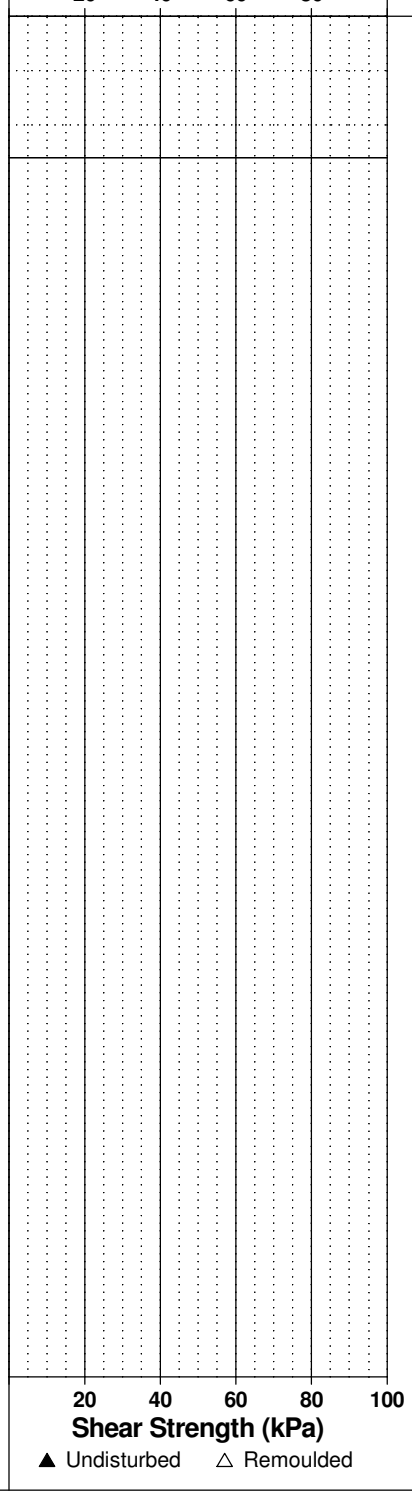
FILE NO. PG0861

REMARKS

HOLE NO. TP19-18

BORINGS BY Backhoe **DATE** July 10, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	86.62		
Brown **SILTY CLAY**									
0.52									
End of Test Pit									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

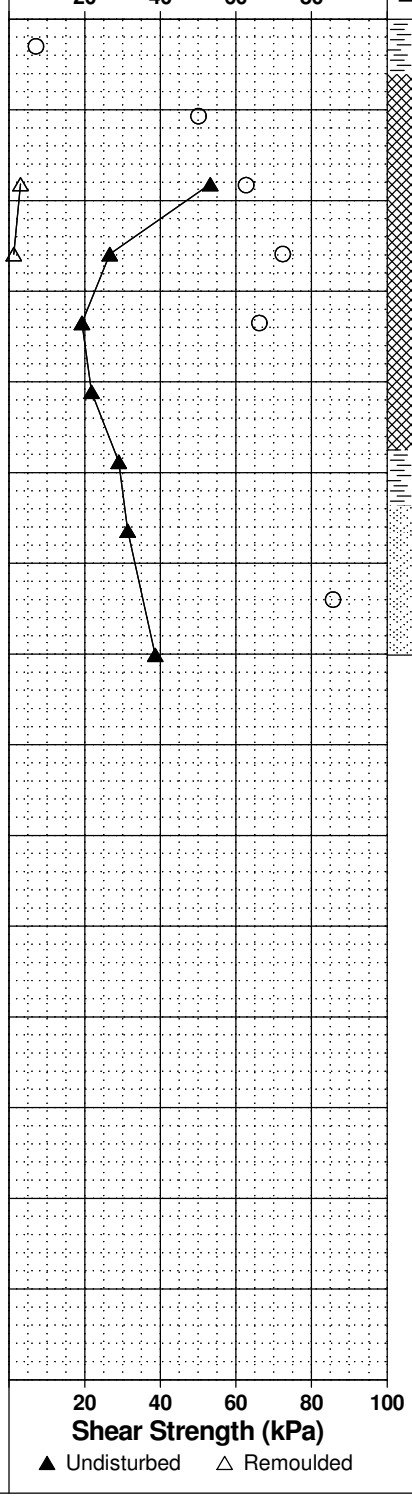
FILE NO. PG0861

REMARKS

HOLE NO. BH 1A-17

BORINGS BY CME 55 Power Auger **DATE** May 8, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.15
FILL: Brown silty clay, some gravel, trace sand, cobbles and boulders		AU	1				
0.48							
		SS	2	79	5	1	86.15
Stiff, brown **SILTY CLAY,** trace sand		SS	3	100	P	2	85.15
		SS	4	100	P		
3.05						3	84.15
		SS	5	100	P		
Soft to firm, grey **SILTY CLAY**						4	83.15
						5	82.15
						6	81.15
		SS	6	100	P		
7.01						7	80.15
Dynamic Cone Penetration Test commenced @ 7.01m depth. Cone pushed to 25.4m depth.						8	79.15
						9	78.15
						10	77.15
Inferred **SILTY CLAY**						11	76.15
						12	75.15
						13	74.15
						14	73.15
						15	72.15



Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

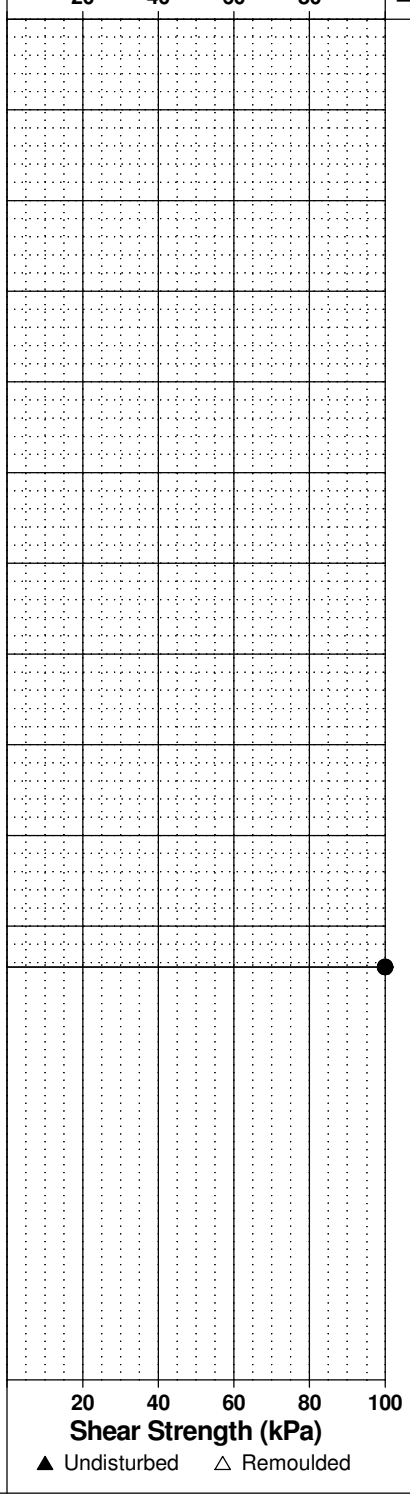
FILE NO. PG0861

REMARKS

HOLE NO. BH 1A-17

BORINGS BY CME 55 Power Auger **DATE** May 8, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						15	72.15		
						16	71.15		
						17	70.15		
						18	69.15		
Inferred **SILTY CLAY**						19	68.15		
						20	67.15		
						21	66.15		
						22	65.15		
						23	64.15		
						24	63.15		
						25	62.15		
25.40									
Inferred **GLACIAL TILL** 25.45									
End of Borehole									
Practical DCPT refusal @ 25.45m depth									
(GWL @ 6.33m - May 15, 2017)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. BH 1B-17

BORINGS BY CME 55 Power Auger **DATE** May 8, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE									
FILL: Brown silty clay, some gravel, trace sand, cobbles and boulders						0	87.15		
0.48									
Stiff, brown **SILTY CLAY,** trace sand						1	86.15		
						2	85.15		
3.05									
Soft to firm, grey **SILTY CLAY**		TW	1	100		3	84.15		
3.66									
End of Borehole									

Pen. Resist. Blows/0.3m: ○ Water Content % — 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

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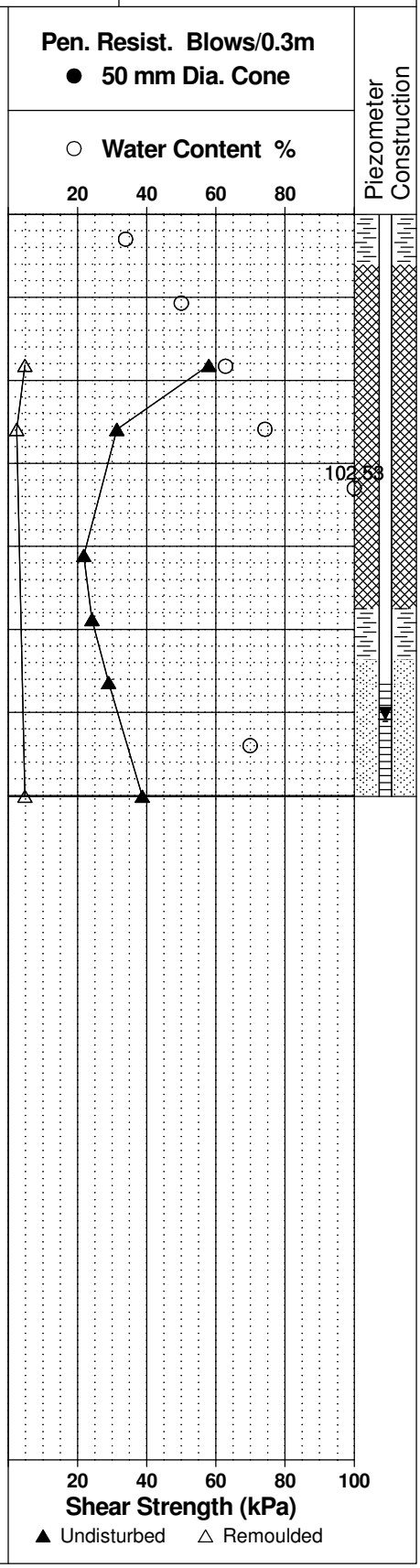
FILE NO. PG0861

REMARKS

HOLE NO. BH 2-17

BORINGS BY CME 55 Power Auger **DATE** May 8, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.20
TOPSOIL with organics 0.30		AU	1				
Stiff, brown **SILTY CLAY** trace sand		SS	2	75	4	1	86.20
		SS	3	100	P	2	85.20
2.29		SS	4	100	P		
		TW	5	100		3	84.20
Soft to firm, grey **SILTY CLAY**						4	83.20
						5	82.20
		SS	6	100	P	6	81.20
7.01						7	80.20
End of Borehole							
(GWL @ 6.08m - May 15, 2017)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

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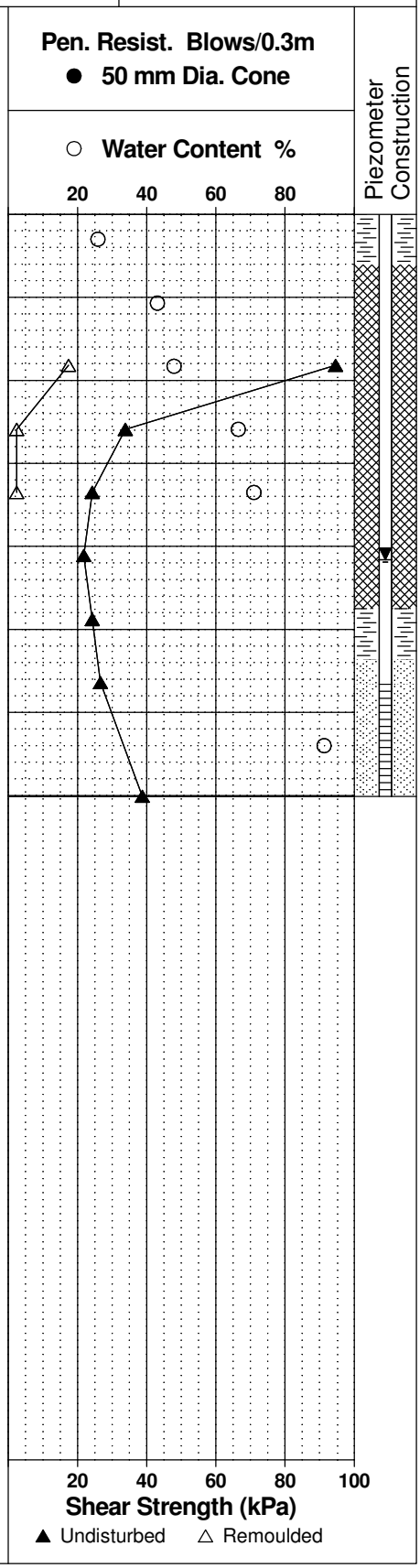
FILE NO. PG0861

REMARKS

HOLE NO. BH 3A-17

BORINGS BY CME 55 Power Auger **DATE** May 8, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.59
FILL: Topsoil with organics, some gravel 0.28		AU	1				
		SS	2	75	6	1	86.59
Stiff, brown **SILTY CLAY**		SS	3	100	P	2	85.59
		SS	4	100	P		
3.05						3	84.59
		SS	5	100	P		
Soft to firm, grey **SILTY CLAY**						4	83.59
						5	82.59
						6	81.59
		SS	6	100	P		
7.01						7	80.59
End of Borehole							
(GWL @ 4.16m - May 15, 2017)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. BH 3B-17

BORINGS BY CME 55 Power Auger **DATE** May 8, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.59		
FILL: Topsoil with organics, some gravel 0.28									
Stiff, brown **SILTY CLAY**						1	86.59		
						2	85.59		
3.05						3	84.59		
Soft to firm, grey **SILTY CLAY**		TW	1	92		4	83.59		
4.42									
End of Borehole									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

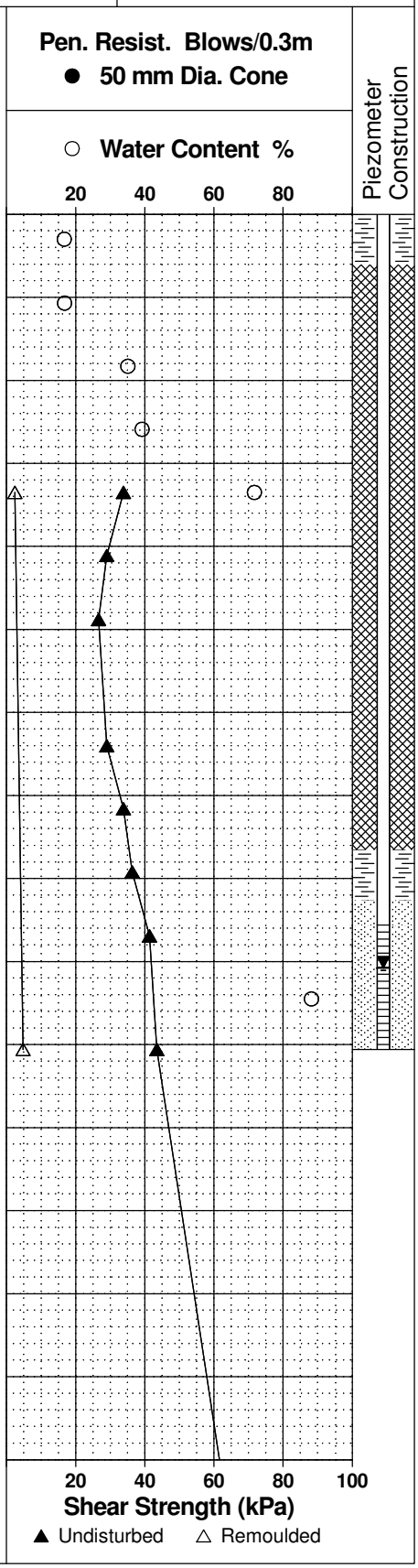
FILE NO. PG0861

REMARKS

HOLE NO. BH 4-17

BORINGS BY CME 55 Power Auger **DATE** May 8, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.09
FILL: Topsoil with organics, some gravel 0.15		AU	1				
Stiff, brown **SILTY CLAY**		SS	2	33	3	1	87.09
1.73		SS	3	67	9	2	86.09
		SS	4	71	4		
Soft to firm, grey **SILTY CLAY**		SS	5	100	P	3	85.09
4.57						4	84.09
		TW	6	100		5	83.09
Firm, grey **SILTY CLAY**						6	82.09
						7	81.09
						8	80.09
		SS	7	100	P	9	79.09
10.06						10	78.09
Dynamic Cone Penetration Test commenced @ 10.06m depth. Cone pushed to 25.3m depth.						11	77.09
						12	76.09
Inferred **SILTY CLAY**						13	75.09
						14	74.09
						15	73.09



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

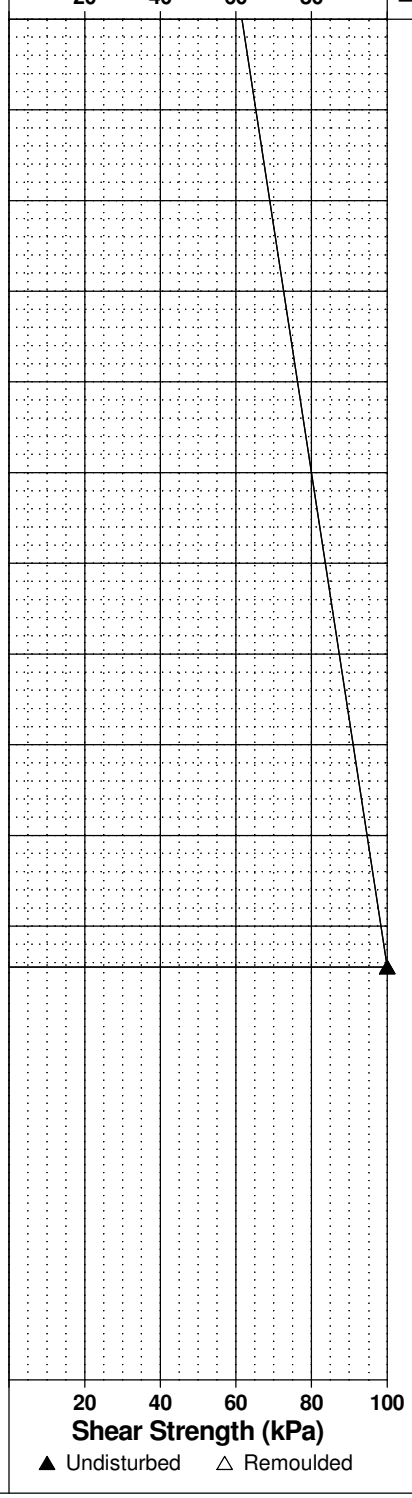
FILE NO. PG0861

REMARKS

HOLE NO. BH 4-17

BORINGS BY CME 55 Power Auger **DATE** May 8, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						15	73.09		
						16	72.09		
						17	71.09		
						18	70.09		
						19	69.09		
Inferred **SILTY CLAY**						20	68.09		
						21	67.09		
						22	66.09		
						23	65.09		
						24	64.09		
25.30						25	63.09		
Inferred **GLACIAL TILL** 25.45									
End of Borehole									
Practical DCPT refusal @ 25.45m depth									
(GWL @ 9.08m - May 15, 2017)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

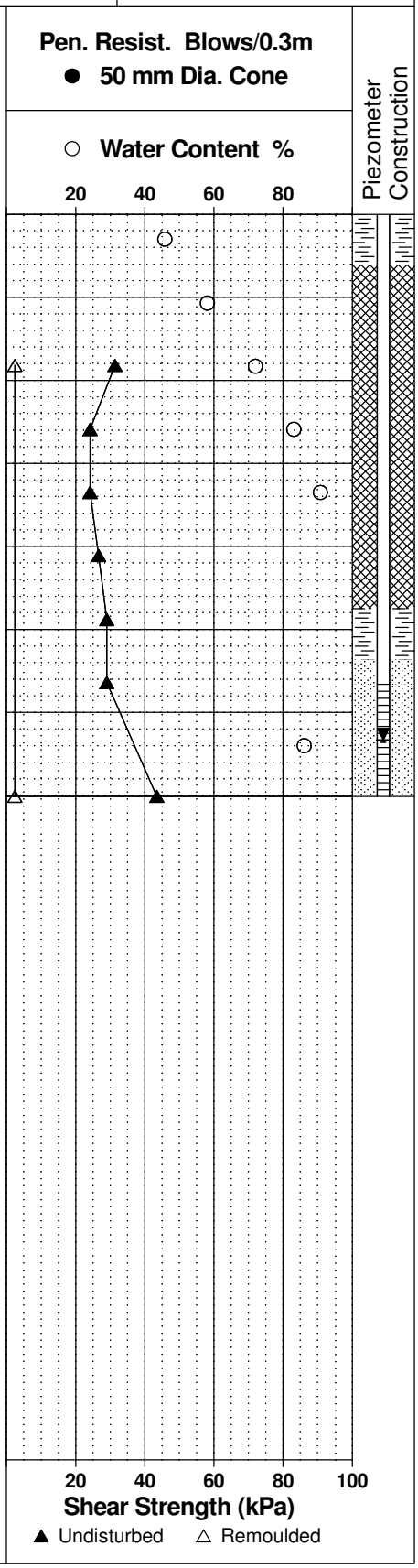
FILE NO. PG0861

REMARKS

HOLE NO. BH 5A-17

BORINGS BY CME 55 Power Auger **DATE** May 9, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.14
TOPSOIL with organics 0.25		AU	1				
		SS	2	100	4	1	86.14
Firm, brown **SILTY CLAY**		SS	3	88	P	2	85.14
		SS	4	100	P		
3.05						3	84.14
		SS	5	100	P		
Soft to firm, grey **SILTY CLAY**						4	83.14
						5	82.14
						6	81.14
		SS	6	100	P		
7.01						7	80.14
End of Borehole							
(GWL @ 6.33m - May 15, 2017)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

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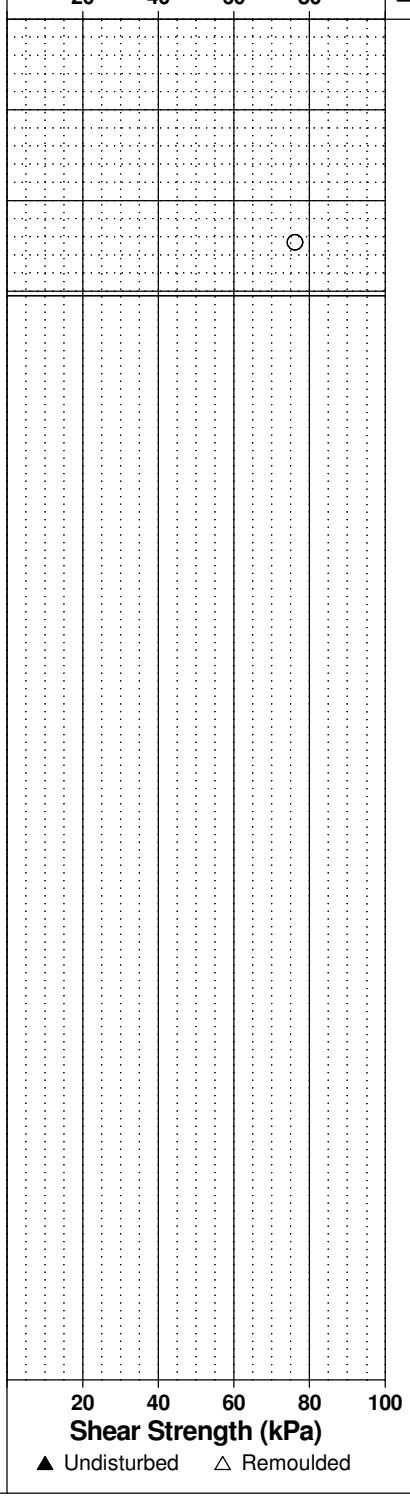
FILE NO. PG0861

REMARKS

HOLE NO. BH 5B-17

BORINGS BY CME 55 Power Auger **DATE** May 9, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL with organics 0.25						0	87.14		
Firm, brown **SILTY CLAY**		TW	1	100		1	86.14		
						2	85.14		
3.05 End of Borehole						3	84.14		



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

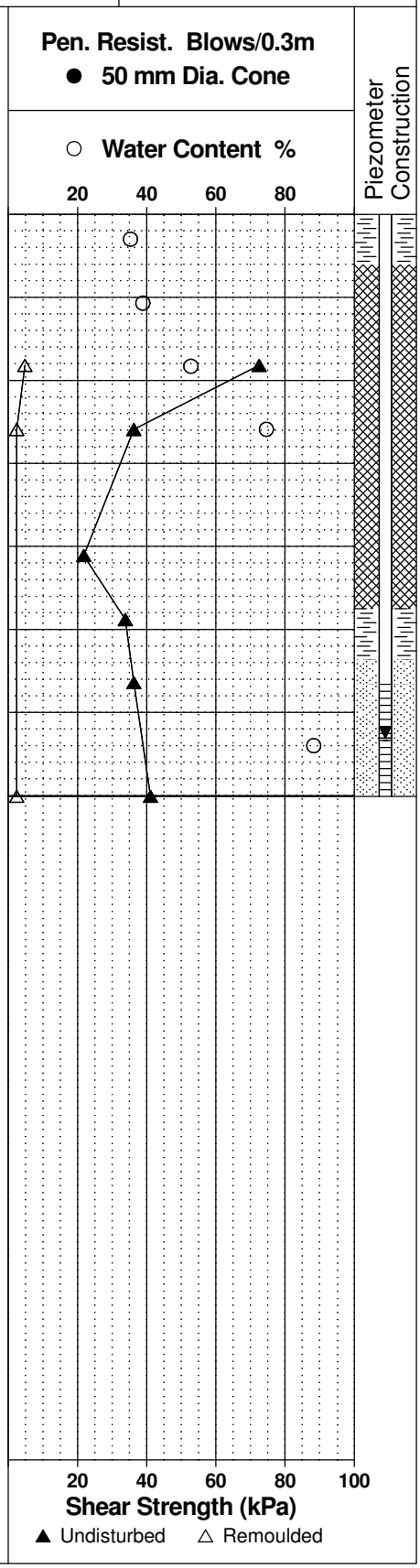
FILE NO. PG0861

REMARKS

HOLE NO. BH 6-17

BORINGS BY CME 55 Power Auger **DATE** May 9, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.09
FILL: Brown silty clay, some gravel, trace organics (0.18)		AU	1				
Stiff, brown **SILTY CLAY,** trace sand		SS	2	92	7	1	86.09
- with organics to 0.25m depth		SS	3	100	P	2	85.09
		SS	4	100	P		
(3.05)						3	84.09
		TW	5	100		4	83.09
Soft to firm, grey **SILTY CLAY**						5	82.09
						6	81.09
		SS	6	100	P		
(7.01)						7	80.09
End of Borehole							
(GWL @ 6.31m - May 15, 2017)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

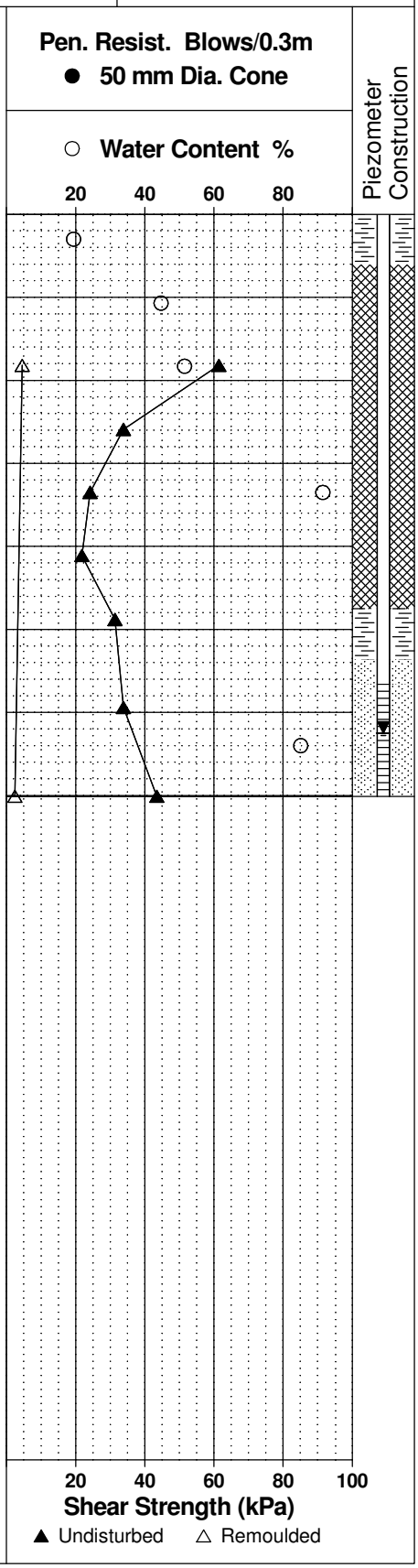
FILE NO. PG0861

REMARKS

HOLE NO. BH 7A-17

BORINGS BY CME 55 Power Auger **DATE** May 9, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.29
FILL: Bronw silty clay with crushed stone, trace cobbles and sand		AU	1				
0.69						1	86.29
		SS	2	83	5		
Stiff, brown **SILTY CLAY**		SS	3	100	P	2	85.29
		SS	4	0	P		
3.05						3	84.29
		SS	5	100	P		
Soft to firm, grey **SILTY CLAY**						4	83.29
						5	82.29
						6	81.29
		SS	6	100	P		
7.01						7	80.29
End of Borehole							
(GWL @ 6.25m - May 15, 2017)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

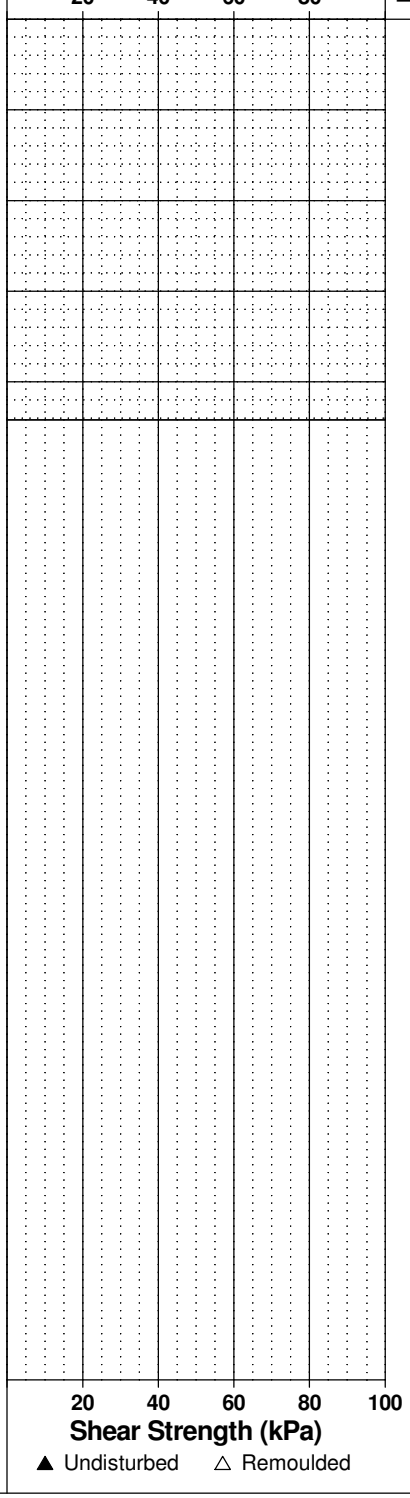
FILE NO. PG0861

REMARKS

HOLE NO. BH 7B-17

BORINGS BY CME 55 Power Auger **DATE** May 9, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
FILL: Bronw silty clay with crushed stone, trace cobbles and sand						0	87.29		
0.69									
Stiff, brown **SILTY CLAY**						1	86.29		
						2	85.29		
3.05						3	84.29		
Soft to firm, grey **SILTY CLAY**		TW	1	100		4	83.29		
4.42									
End of Borehole									



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

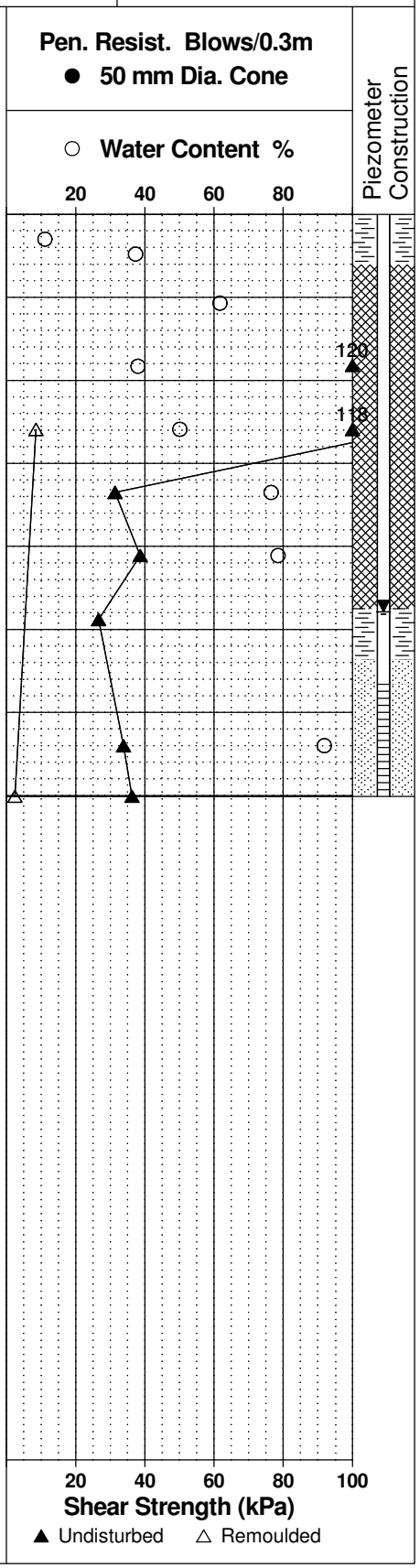
FILE NO. PG0861

REMARKS

HOLE NO. BH 8-17

BORINGS BY CME 55 Power Auger **DATE** May 9, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	88.41
FILL: Brown silty clay, some gravel, trace cobbles, sand and organics 0.53		AU	1				
		SS	2	67	3	1	87.41
		SS	3	71	P	2	86.41
Very stiff to stiff, brown **SILTY CLAY**		SS	4	100	P		
		SS	5	100	P	3	85.41
		SS	6	100	P	4	84.41
4.57						5	83.41
Soft to firm, grey **SILTY CLAY**		TW	7	100		6	82.41
		SS	8	100	P		
7.01						7	81.41
End of Borehole							
(GWL @ 4.79m - May 15, 2017)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

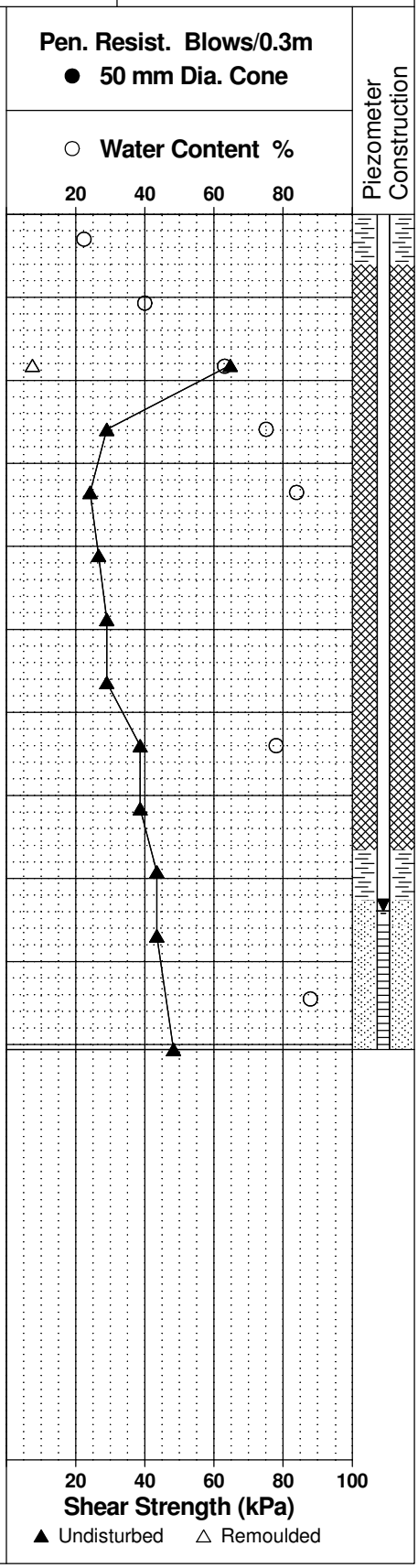
FILE NO. PG0861

REMARKS

HOLE NO. BH 9A-17

BORINGS BY CME 55 Power Auger **DATE** May 9, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.85
FILL: Brown silty clay with crushed stone, trace cobbles and sand -geotextile noted at 0.43m depth (0.43)		AU	1				
		SS	2	75	5	1	86.85
Stiff, brown **SILTY CLAY**		SS	3	100	P	2	85.85
		SS	4	100	P		
(3.05)						3	84.85
		SS	5	100	P		
						4	83.85
						5	82.85
Soft to firm, grey **SILTY CLAY**						6	81.85
		SS	6	100	P		
						7	80.85
						8	79.85
						9	78.85
		SS	7	100	P		
(10.06)						10	77.85
End of Borehole							
(GWL @ 8.39m - May 15, 2017)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. BH 9B-17

BORINGS BY CME 55 Power Auger **DATE** May 10, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
FILL: Brown silty clay with crushed stone, trace cobbles and sand -geotextile noted at 0.43m depth (0.43)						0	87.85		
Stiff, brown **SILTY CLAY**						1	86.85		
						2	85.85		
(3.05)						3	84.85		
Soft to firm, grey **SILTY CLAY** (3.66)		TW	1	100				○	
End of Borehole									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

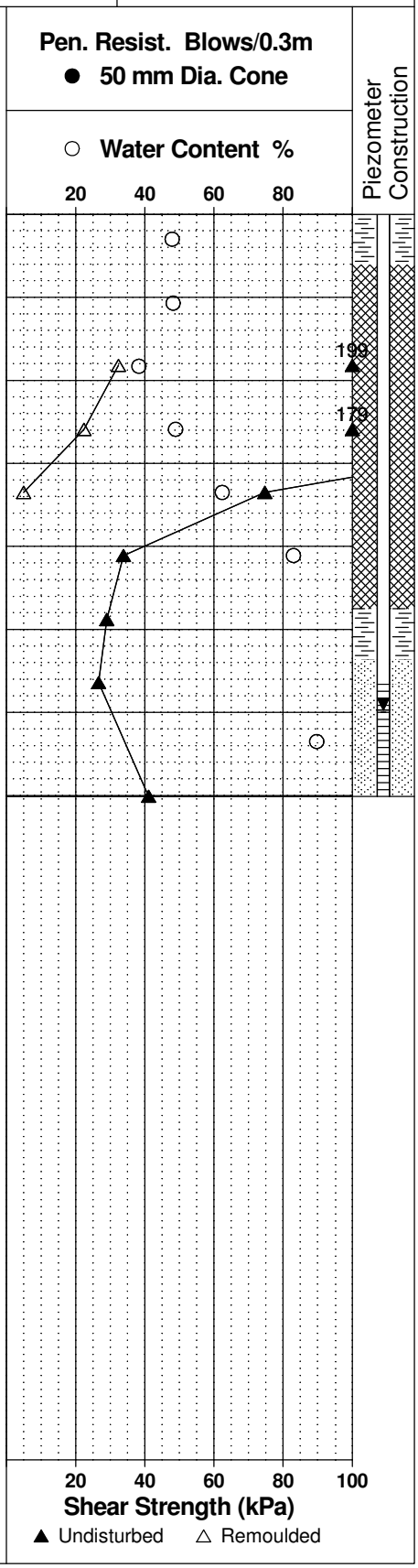
FILE NO. PG0861

REMARKS

HOLE NO. BH10-17

BORINGS BY CME 55 Power Auger **DATE** May 10, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.96
FILL: Grey silty clay, some to trace organics, trace topsoil		AU	1				
1.07		SS	2	58	0	1	86.96
		SS	3	75	P	2	85.96
Stiff to very stiff, brown **SILTY CLAY**		SS	4	100	P		
		SS	5	100	P	3	84.96
3.81		SS	6	100	P	4	83.96
Firm, grey **SILTY CLAY**						5	82.96
		TW	7	100		6	81.96
7.01						7	80.96
End of Borehole							
(GWL @ 5.97m - May 15, 2017)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

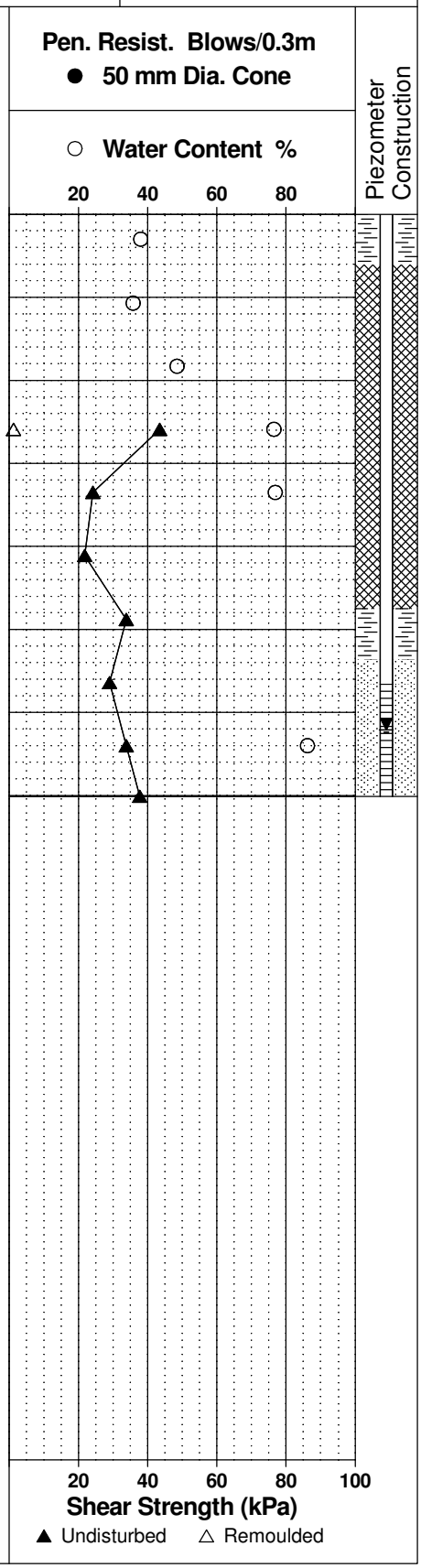
FILE NO. PG0861

REMARKS

HOLE NO. BH11A-17

BORINGS BY CME 55 Power Auger **DATE** May 10, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.20
TOPSOIL with organics		AU	1				
0.41							
		SS	2	88	11	1	86.20
Stiff to firm, brown **SILTY CLAY,** trace sand		SS	3	100	3	2	85.20
		SS	4	100	P		
3.05						3	84.20
		SS	5	100	P		
Soft to firm, grey **SILTY CLAY**						4	83.20
						5	82.20
						6	81.20
		SS	6	100	P		
7.01						7	80.20
End of Borehole							
(GWL @ 6.21m - May 15, 2017)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. BH11B-17

BORINGS BY CME 55 Power Auger **DATE** May 10, 2017

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL with organics 0.41						0	87.20		
Stiff to firm, brown **SILTY CLAY** trace sand						1	86.20		
						2	85.20		
3.05						3	84.20		
Soft to firm, grey **SILTY CLAY**		TW	1	100		4	83.20		
4.42									
End of Borehole									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

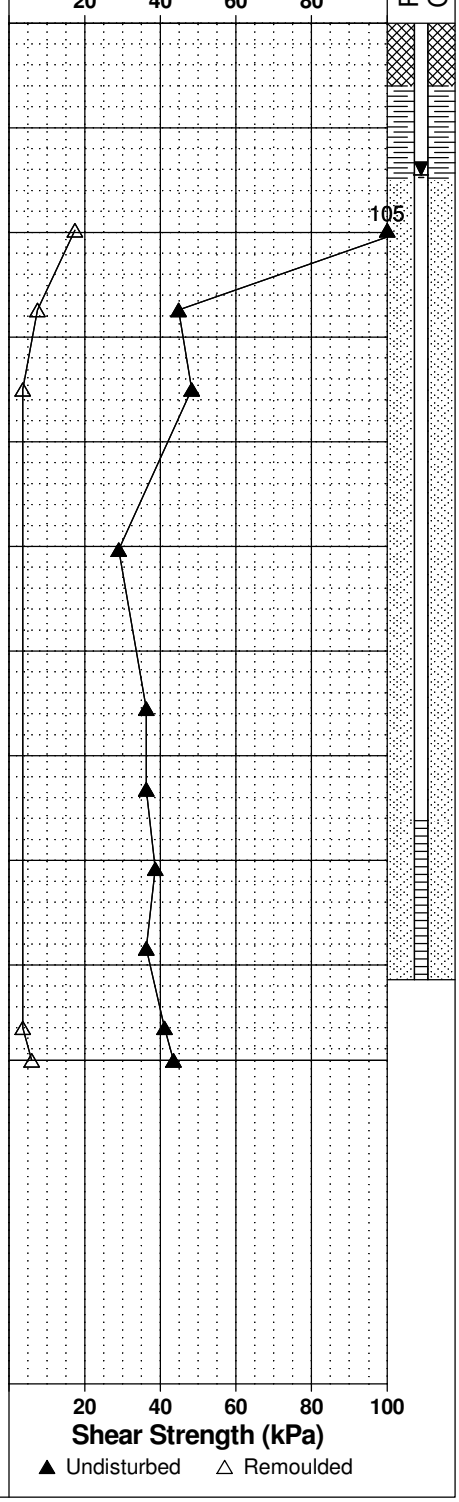
FILE NO. PG0861

REMARKS

HOLE NO. BH14-08

BORINGS BY CME 75 Power Auger **DATE** October 15, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.03
TOPSOIL 0.20		AU	1				
		SS	2	75	9	1	86.03
Very stiff to stiff, brown **SILTY CLAY**						2	85.03
- firm and grey by 2.0m depth						3	84.03
		TW	3	100		4	83.03
						5	82.03
		TW	4	100		6	81.03
						7	80.03
						8	79.03
						9	78.03
9.91							
End of Borehole							
(GWL @ 1.45m-Oct. 23/08)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

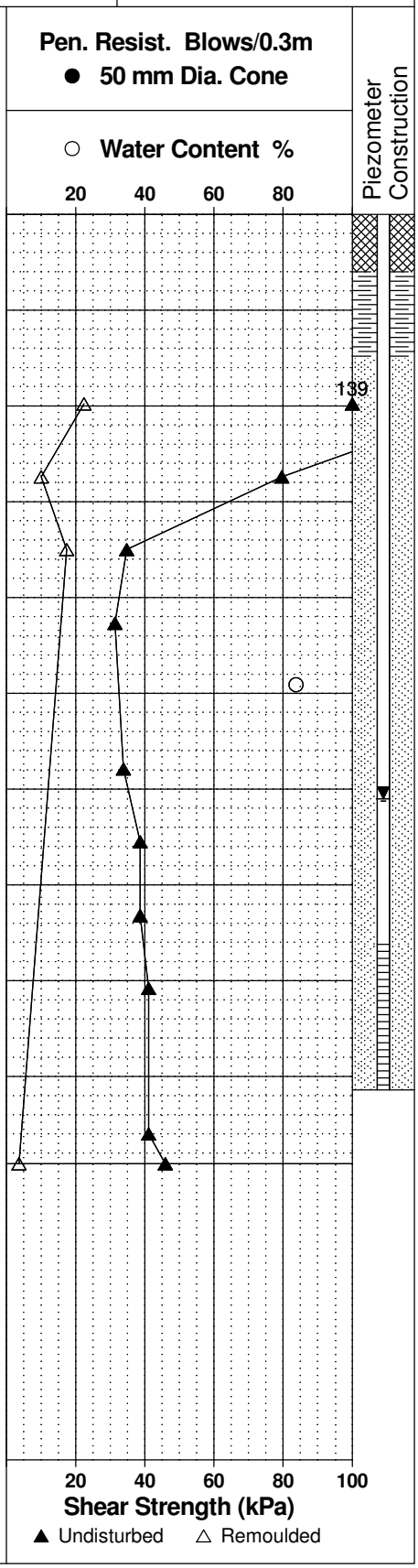
FILE NO. PG0861

REMARKS

HOLE NO. BH15-08

BORINGS BY CME 75 Power Auger **DATE** October 16, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.24
TOPSOIL 0.20							
		SS	1	67	11	1	86.24
Very stiff to stiff, brown **SILTY CLAY**						2	85.24
- stiff to firm and grey by 2.5m depth						3	84.24
						4	83.24
		TW	2	100		5	82.24
						6	81.24
						7	80.24
		SS	3	100		8	79.24
		AU	5				
		TW	4	100		9	78.24
9.91							
End of Borehole							
(GWL @ 6.10m-Oct. 23/08)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

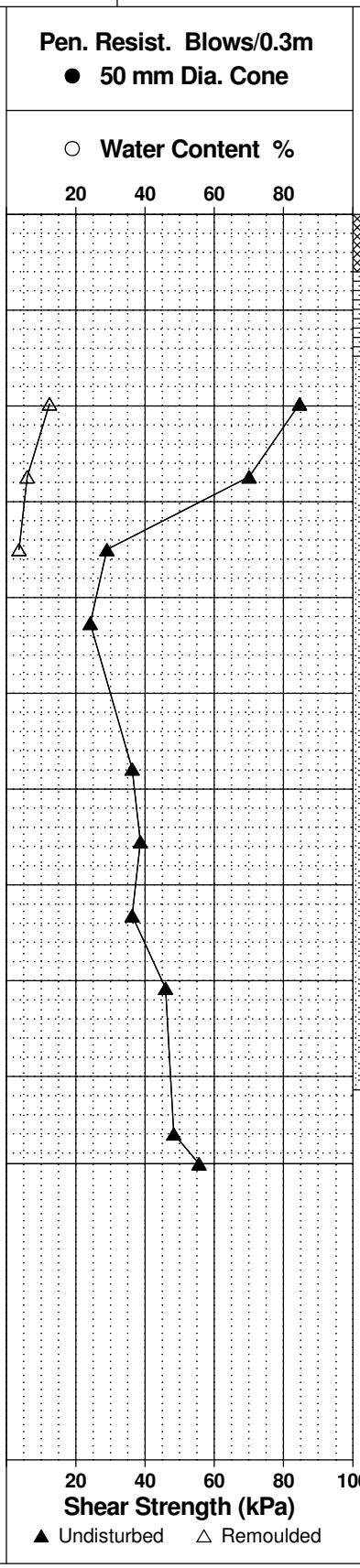
FILE NO. PG0861

REMARKS

HOLE NO. BH16-08

BORINGS BY CME 75 Power Auger **DATE** October 15, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	86.88
TOPSOIL 0.20							
Stiff, brown **SILTY CLAY**		SS	1	75	6	1	85.88
- grey-brown by 0.9m depth							
- stiff to firm and grey by 2.0m depth						2	84.88
						3	83.88
						4	82.88
		TW	2	100		5	81.88
						6	80.88
						7	79.88
						8	78.88
		TW	3	100		9	77.88
9.91							
End of Borehole							
(GWL @ 3.20m-Oct. 23/08)							



Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

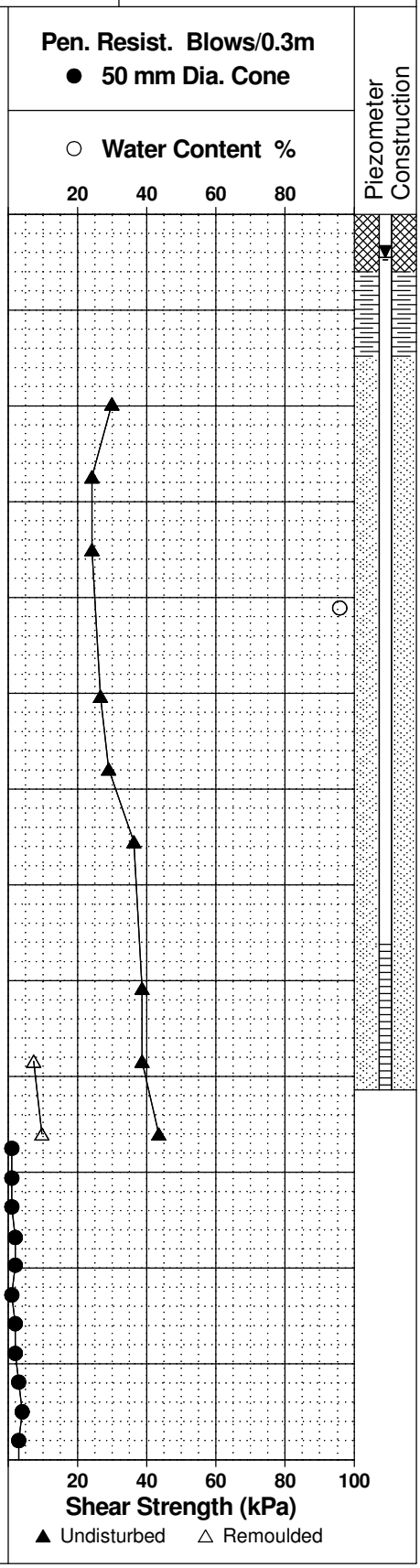
FILE NO. PG0861

REMARKS

HOLE NO. BH17-08

BORINGS BY CME 75 Power Auger **DATE** October 15, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.41
TOPSOIL 0.25		AU	1				
Stiff to firm, brown **SILTY CLAY**		SS	2			1	86.41
- grey-brown by 0.9m depth						2	85.41
- grey by 1.4m depth						3	84.41
		TW	3	96		4	83.41
						5	82.41
						6	81.41
		TW	4	100		7	80.41
						8	79.41
						9	78.41
9.60 Dynamic Cone Penetration Test commenced @ 9.60m depth						10	77.41
						11	76.41
Inferred **SILTY CLAY**						12	75.41
						13	74.41



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

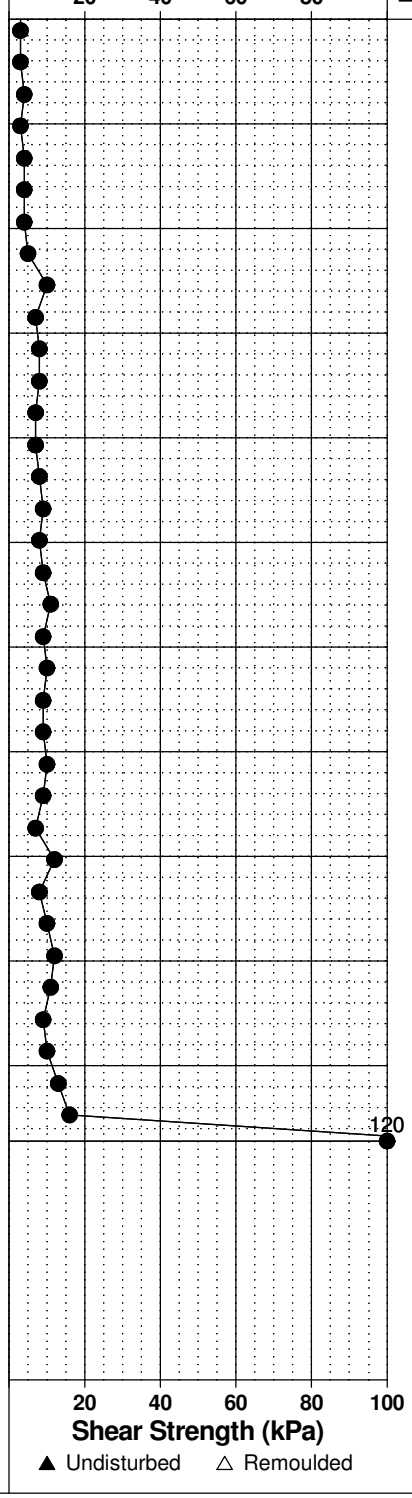
FILE NO. PG0861

REMARKS

HOLE NO. BH17-08

BORINGS BY CME 75 Power Auger **DATE** October 15, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						13	74.41		
						14	73.41		
						15	72.41		
						16	71.41		
						17	70.41		
Inferred **SILTY CLAY**						18	69.41		
						19	68.41		
						20	67.41		
						21	66.41		
21.60						22	65.41		
Inferred **GLACIAL TILL**						23	64.41		
23.72									
End of Borehole									
Practical DCPT refusal @ 23.72m depth									
(GWL @ 0.45m-Oct. 23/08)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

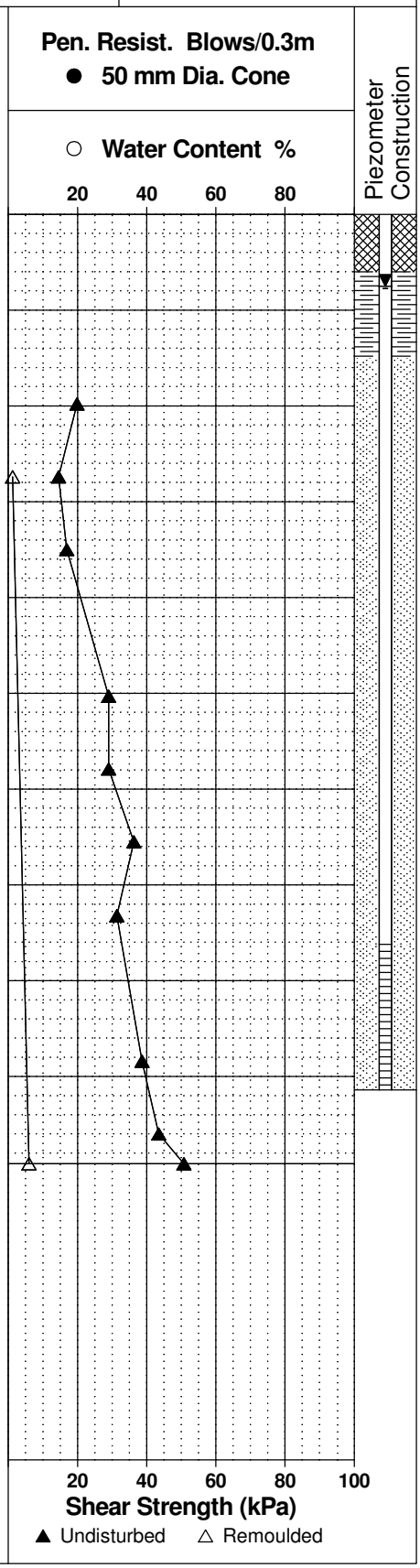
FILE NO. PG0861

REMARKS

HOLE NO. BH18-08

BORINGS BY CME 75 Power Auger **DATE** October 15, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.29
TOPSOIL 0.20		AU	1				
Stiff to firm, brown **SILTY CLAY**		SS	2		7	1	86.29
- firm to soft and grey-brown by 1.1m depth						2	85.29
- soft to firm and grey by 1.4m depth						3	84.29
		TW	3	100		4	83.29
						5	82.29
						6	81.29
						7	80.29
		TW	4	100		8	79.29
						9	78.29
9.91							
End of Borehole							
(GWL @ 0.75m-Oct. 23/08)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

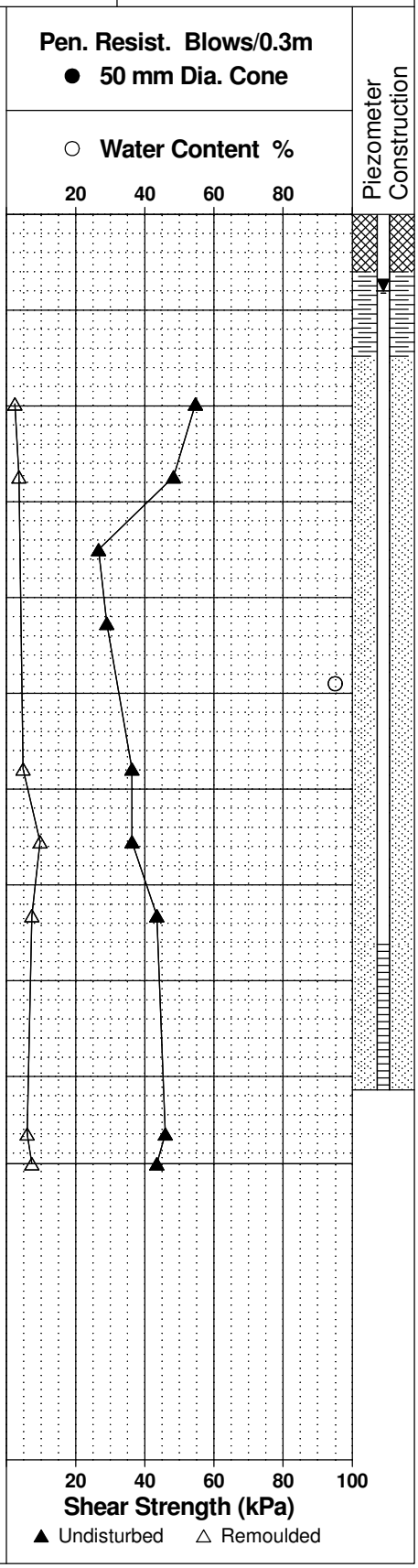
FILE NO. PG0861

REMARKS

HOLE NO. BH19-08

BORINGS BY CME 75 Power Auger **DATE** October 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	86.80
TOPSOIL 0.30		AU	1				
		SS	2	75	6	1	85.80
Stiff, brown **SILTY CLAY**						2	84.80
- firm and grey by 1.6m depth						3	83.80
						4	82.80
		TW	3	100		5	81.80
						6	80.80
						7	79.80
		TW	4	100		8	78.80
						9	77.80
9.91 End of Borehole							
(GWL @ 0.80m-Oct. 23/08)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. BH20-08

BORINGS BY CME 75 Power Auger **DATE** October 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.11
TOPSOIL 0.15		AU	1				
		SS	2	75	7	1	86.11
Stiff to firm, brown **SILTY CLAY**						2	85.11
- firm and grey by 1.7m depth						3	84.11
		TW	3	100		4	83.11
						5	82.11
		TW	4	100		6	81.11
						7	80.11
						8	79.11
						9	78.11
9.91 End of Borehole							
(GWL @ 0.84m-Oct. 23/08)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

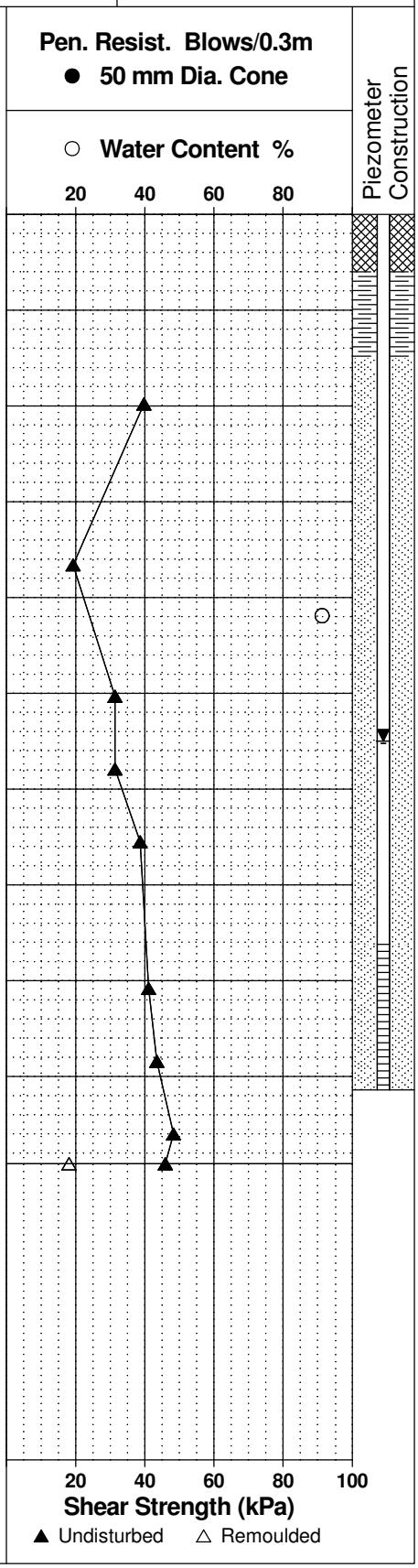
FILE NO. PG0861

REMARKS

HOLE NO. BH21-08

BORINGS BY CME 75 Power Auger **DATE** October 14, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
TOPSOIL 0.20						0	87.02
		AU	1				
		SS	2	83	7	1	86.02
Stiff to firm, brown **SILTY CLAY**						2	85.02
		SS	3	100	2		
- firm and grey by 2.4m depth						3	84.02
		TW	4	100		4	83.02
						5	82.02
						6	81.02
		TW	5	100		7	80.02
						8	79.02
						9	78.02
9.91							
End of Borehole							
(GWL @ 5.50m-Oct. 23/08)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

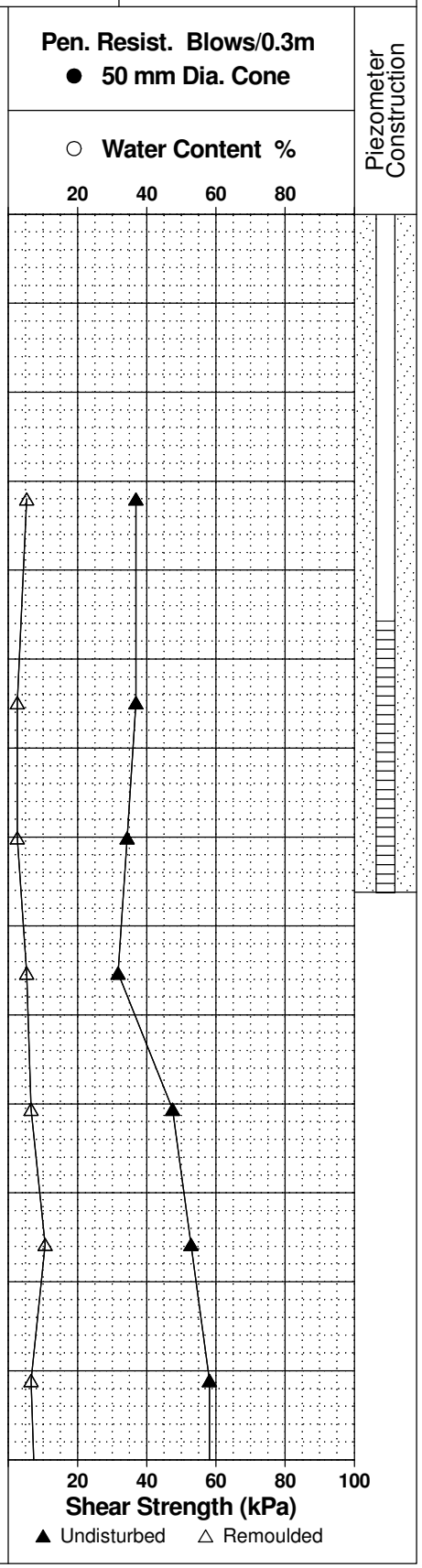
FILE NO. G8533

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** Mar 11, 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.60
TOPSOIL 0.15							
Stiff to very stiff, brown-grey **SILTY CLAY**		SS	1	17	15	1	86.60
		SS	2	25	6	2	85.60
- firm and grey by 2.3m depth		SS	3	100	2	3	84.60
		SS	4	100	1	4	83.60
		SS	5	92	1	5	82.60
		SS	6	100	1	6	81.60
		SS	7	100	1	7	80.60
		SS	8	100	1	8	79.60
		SS	9	100	7	9	78.60
- stiff by 11.6m depth		SS	10	100	1	10	77.60
						11	76.60
						12	75.60
						13	74.60
14.00						14	73.60



Piezometer Construction

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154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

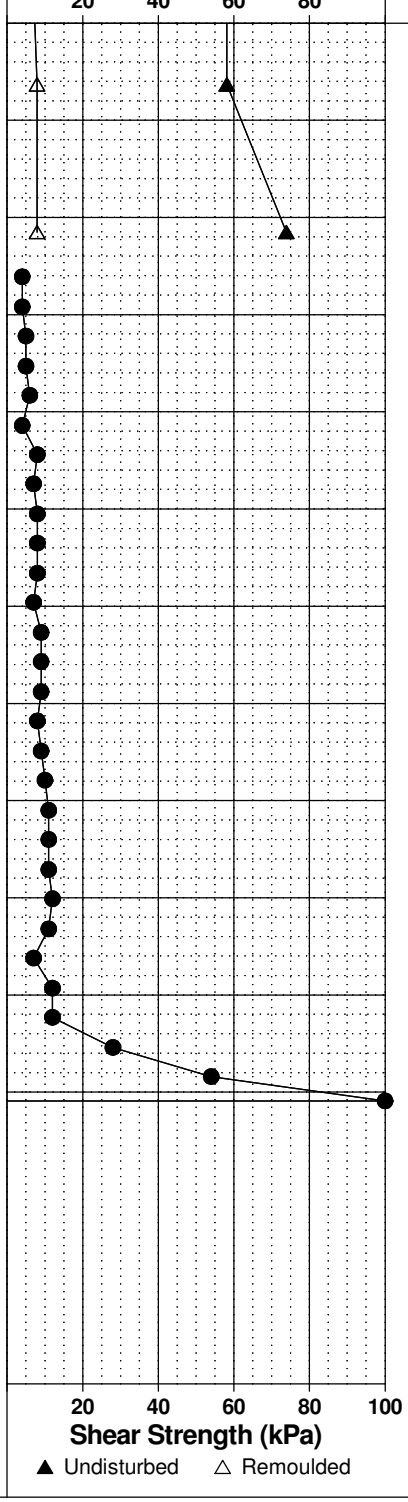
FILE NO. G8533

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** Mar 11, 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Stiff, grey **SILTY CLAY**		SS	11	100	1	14	73.60
						15	72.60
		SS	12	100	1	16	71.60
16.46							
Dynamic Cone Penetration Test commenced @ 16.46m depth						17	70.60
						18	69.60
						19	68.60
						20	67.60
						21	66.60
						22	65.60
						23	64.60
						24	63.60
25.09						25	62.60
End of Borehole Cone refusal @ 25.09m depth (Standpipe damaged - March 26/02)							



Piezometer Construction

patersongroup Consulting Engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

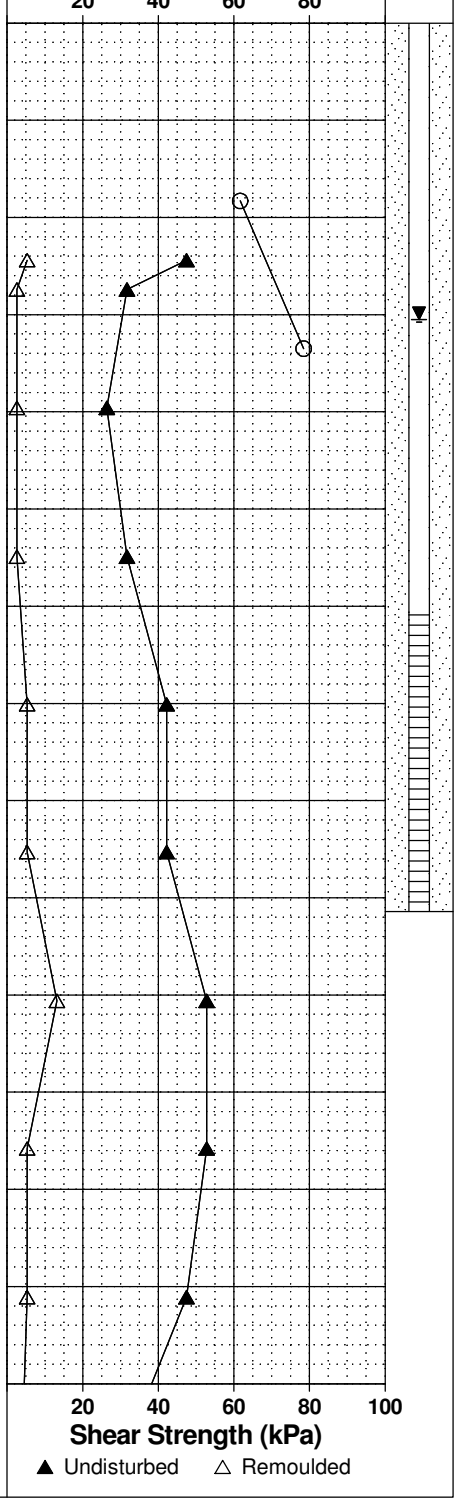
FILE NO. G8533

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** Mar 11, 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.20
TOPSOIL 0.18							
Stiff to very stiff, brown-grey **SILTY CLAY**		SS	1	12	8	1	86.20
- firm by 1.5m depth		SS	2	75	2	2	85.20
- grey by 3.0m depth		SS	3	100	3	3	84.20
		SS	4	100	1	4	83.20
		SS	5	100	1	5	82.20
		SS	6	100	1	6	81.20
		SS	7	100	1	7	80.20
- stiff to firm by 10.0m depth		SS	8	100	1	8	79.20
		SS	9	100	1	9	78.20
14.00						10	77.20
						11	76.20
						12	75.20
						13	74.20
						14	73.20



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154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

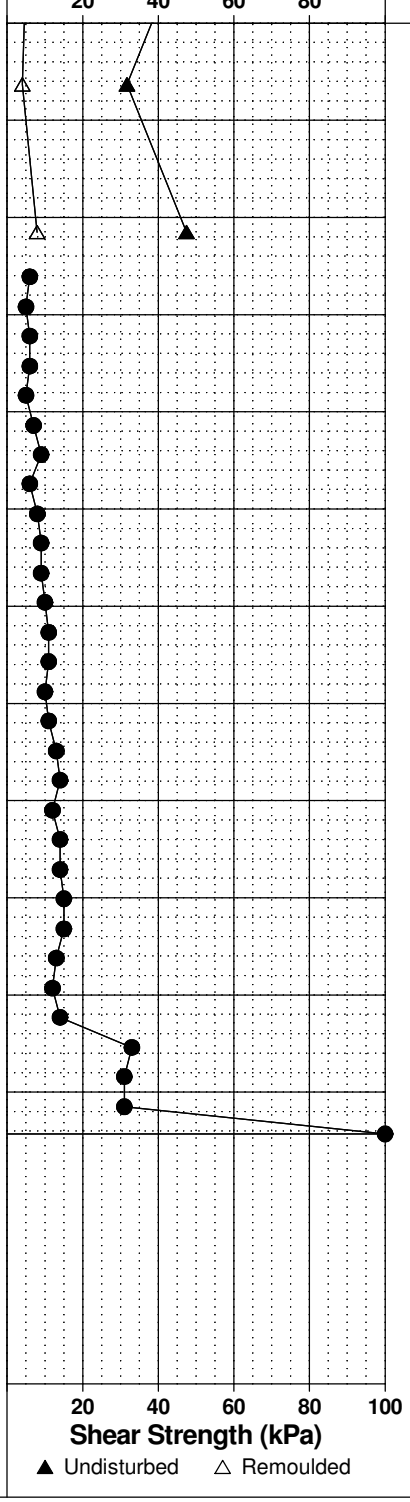
FILE NO. G8533

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** Mar 11, 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Stiff to firm, grey **SILTY CLAY**		SS	10	100	1	14	73.20
		SS	11	100	1	15	72.20
						16	71.20
16.46							
Dynamic Cone Penetration Test commenced @ 16.46m depth						17	70.20
						18	69.20
						19	68.20
						20	67.20
						21	66.20
						22	65.20
						23	64.20
						24	63.20
						25	62.20
25.43							
End of Borehole Cone refusal @ 25.43m depth (GWL @ 3.05m-March 26/02)							



Piezometer Construction

patersongroup Consulting Engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

FILE NO. G8533

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** Mar 12, 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.50
TOPSOIL 0.15							
Stiff to very stiff, grey-brown **SILTY CLAY**		SS	1	62	5	1	86.50
		SS	2	58	3	2	85.50
- firm by 2.4m depth							
- grey by 3.0m depth		TW	3			3	84.50
		SS	4	100	1	4	83.50
		TW	5			5	82.50
		SS	6	100	1	6	81.50
		TW	7			7	80.50
		SS	8	100	1	8	79.50
		SS	9	100	1	9	78.50
						10	77.50
						11	76.50
						12	75.50
						13	74.50
14.00						14	73.50

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

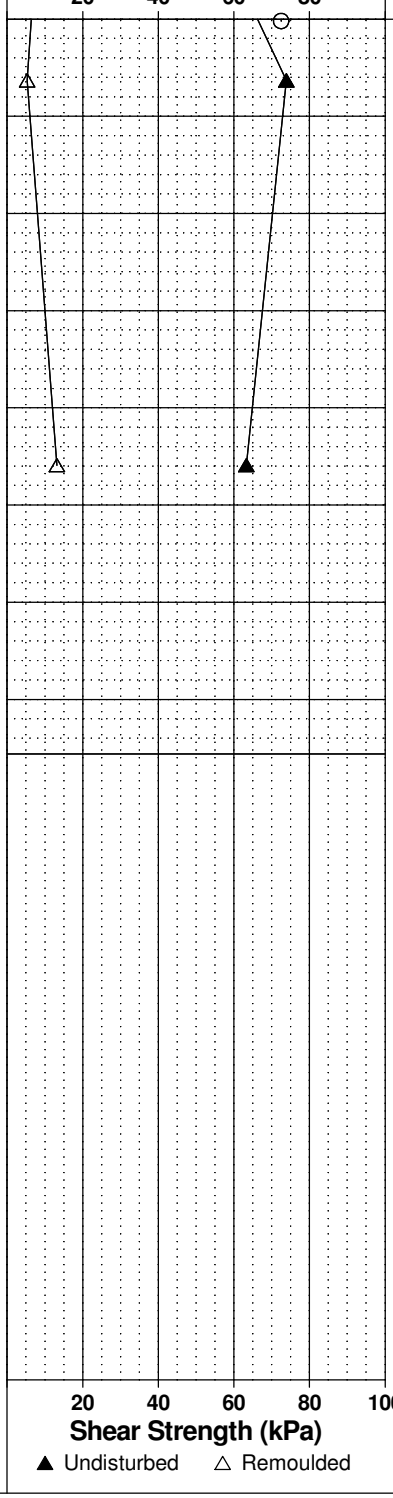
FILE NO. G8533

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** Mar 12, 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
Stiff, grey **SILTY CLAY**		SS	10	100	1	14	73.50		
		TW	11			15	72.50		
						16	71.50		
						17	70.50		
						18	69.50		
						19	68.50		
						20	67.50		
20.73									
GLACIAL TILL: Dense, grey silty sand and gravel						21	66.50		
21.56		SS	12		50+				
End of Borehole									
(Standpipe damaged - March 26/02)									



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154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

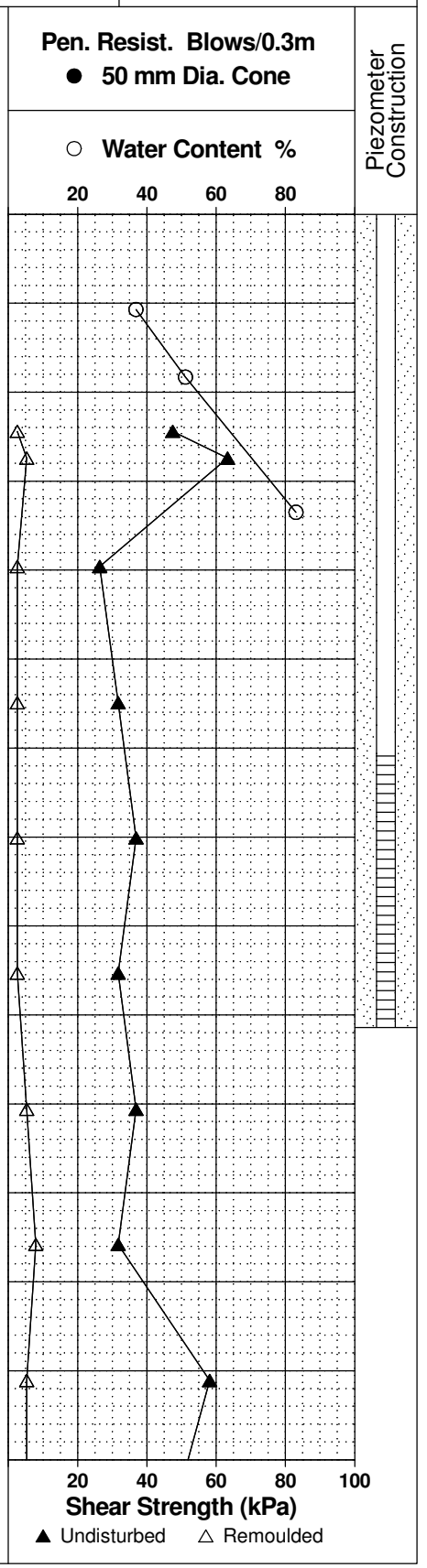
FILE NO. G8533

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** Mar 12, 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	87.40
TOPSOIL 0.15							
Very stiff to stiff, brown-grey **SILTY CLAY**		SS	1	50	9	1	86.40
		SS	2	67	6	2	85.40
- firm and grey by 3.0m depth		SS	3	100	1	3	84.40
		SS	4	100	1	4	83.40
		SS	5	100	1	5	82.40
		SS	6	100	1	6	81.40
		SS	7	100	1	7	80.40
		SS	8	100	1	8	79.40
		SS	9	100	1	9	78.40
						10	77.40
						11	76.40
						12	75.40
						13	74.40
14.00						14	73.40



Piezometer Construction

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154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

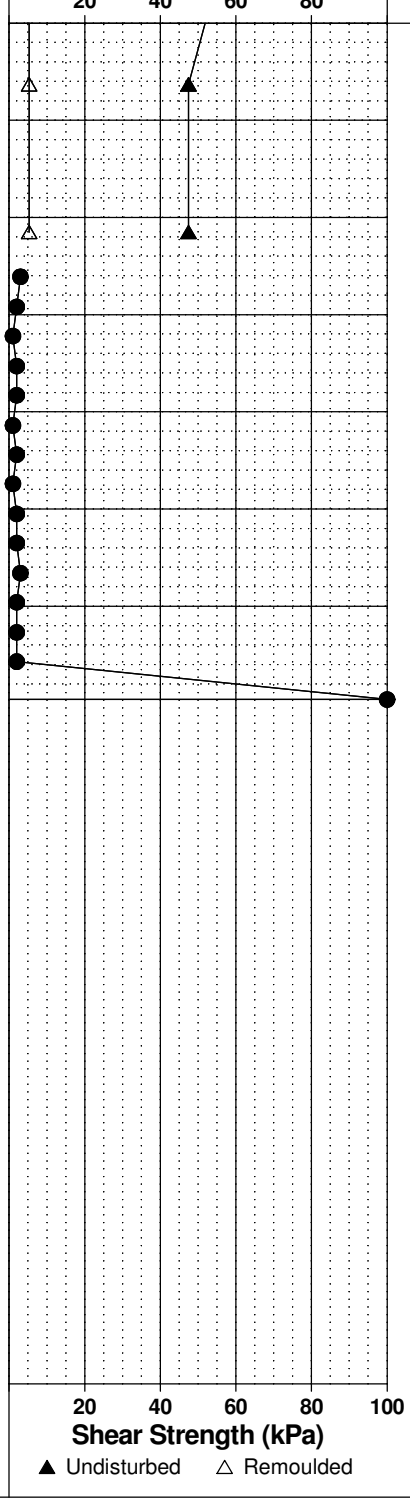
FILE NO. G8533

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** Mar 12, 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Firm to stiff, grey **SILTY CLAY**		SS	10	100	1	14	73.40
		SS	11	100	1	15	72.40
						16	71.40
16.46							
Dynamic Cone Penetration test commenced @ 16.46m depth						17	70.40
						18	69.40
						19	68.40
						20	67.40
20.96							
End of Borehole Cone refusal @ 20.96m depth (Standpipe damaged - March 26/02)							



Piezometer Construction

patersongroup Consulting Engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

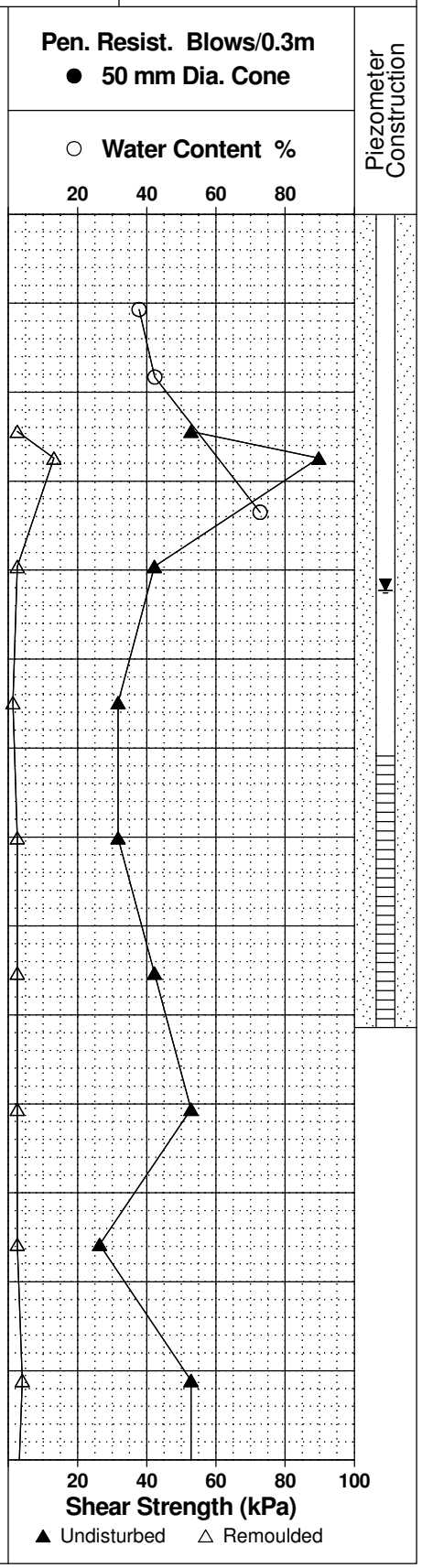
FILE NO. G8533

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** Mar 14, 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	86.80
TOPSOIL 0.18							
Very stiff to stiff, brown-grey **SILTY CLAY**		SS	1	58	10	1	85.80
		SS	2	67	7	2	84.80
- firm and grey by 3.0m depth		SS	3	71	2	3	83.80
		SS	4	100	1	4	82.80
		SS	5	100	1	5	81.80
		SS	6	100	1	6	80.80
		SS	7	100	1	7	79.80
- stiff to firm by 10.0m depth		SS	8	100	1	8	78.80
		SS	9	100	1	9	77.80
14.00						10	76.80
						11	75.80
						12	74.80
						13	73.80
						14	72.80



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

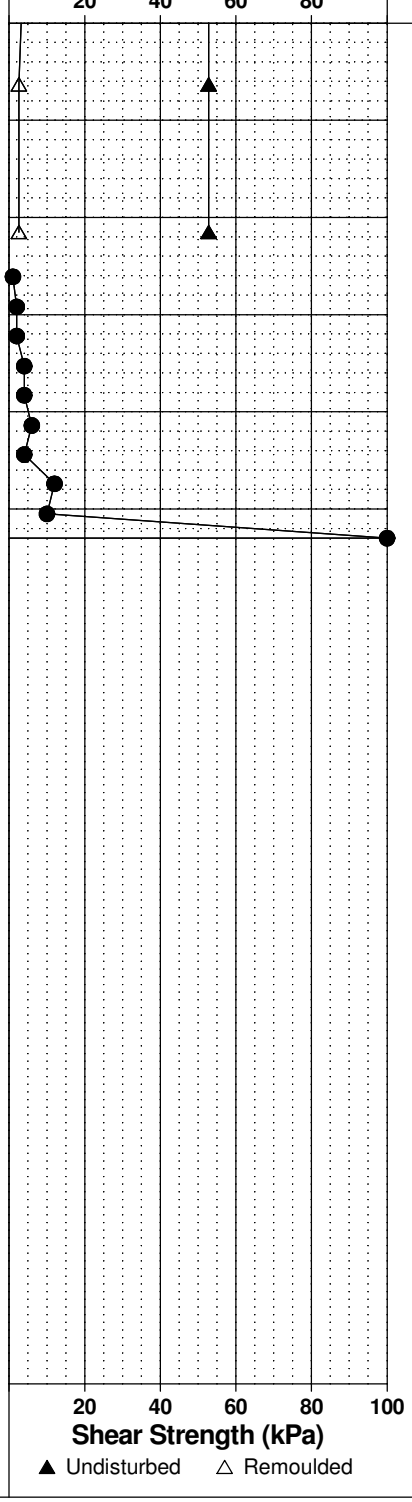
FILE NO. G8533

REMARKS

HOLE NO. BH 7

BORINGS BY CME 55 Power Auger **DATE** Mar 14, 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Stiff, grey **SILTY CLAY**		SS	10	100	1	14	72.80
		SS	11	100	1	15	71.80
						16	70.80
16.46						17	69.80
Dynamic Cone Penetration test commenced @ 16.46m depth						18	68.80
19.30						19	67.80
End of Borehole Cone refusal @ 19.30m depth (GWL @ 4.23m-March 26/02)							



Piezometer Construction

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154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

FILE NO. G8533

REMARKS

HOLE NO. BH 8

BORINGS BY CME 55 Power Auger **DATE** Mar 14, 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	86.80
TOPSOIL 0.20							
		SS	1	58	4	1	85.80
Very stiff to stiff, brown-grey **SILTY CLAY**		SS	2	71	3	2	84.80
- firm and grey by 3.0m depth		TW	3			3	83.80
		SS	4	100	1	4	82.80
		SS	5	100	1	5	81.80
		SS	6	100	1	6	80.80
		SS	7	100	1	7	79.80
		SS	8	100	1	8	78.80
		SS	9	100	1	9	77.80
		SS	10	100	1	10	76.80
14.00						11	75.80
						12	74.80
						13	73.80
						14	72.80

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

Piezometer Construction

patersongroup Consulting Engineers

154 Colonnade Road, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Approximate geodetic, based on base plan provided by Webster and Simmonds Surveying Ltd.

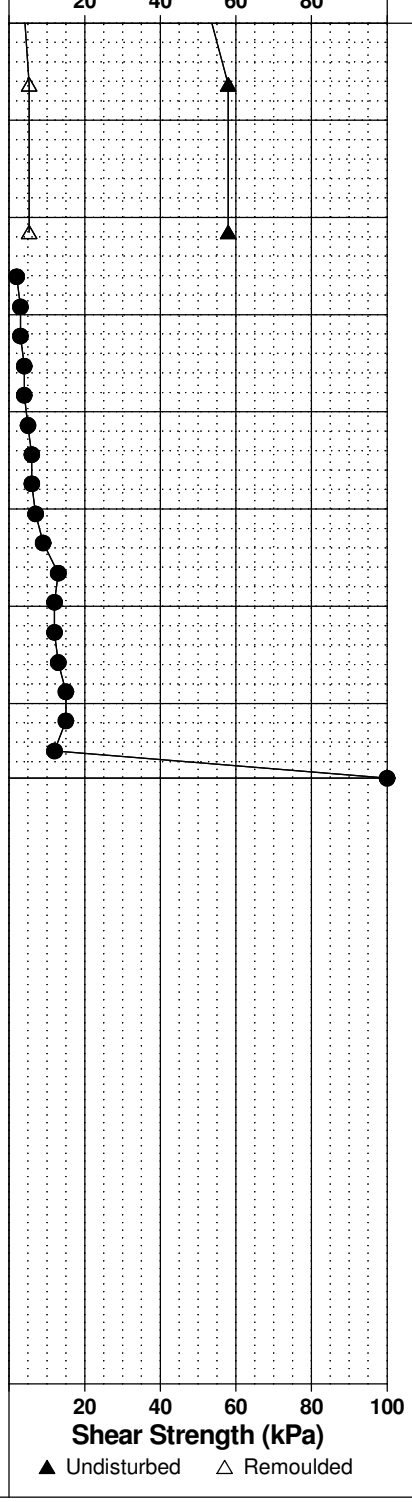
FILE NO. G8533

REMARKS

HOLE NO. BH 8

BORINGS BY CME 55 Power Auger **DATE** Mar 14, 02

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
Firm to stiff, grey **SILTY CLAY**		SS	11	100	1	14	72.80
						15	71.80
						16	70.80
16.46							
Dynamic Cone Penetration test commenced @ 16.46m depth						17	69.80
						18	68.80
						19	67.80
						20	66.80
						21	65.80
21.77							
End of Borehole Cone refusal @ 21.77m depth (GWL @ 0.46m-March 26/02)							



Piezometer Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. TP19-08

BORINGS BY Backhoe **DATE** October 24, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL 0.15						0	87.03		
Stiff, brown **SILTY CLAY**						1	86.03		▽
- stiff to firm and grey by 2.3m depth						2	85.03		
3.35						3	84.03		
End of Test Pit (Groundwater infiltration @ 1.6m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. TP20-08

BORINGS BY Backhoe **DATE** October 24, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.24		
TOPSOIL									
0.30									
Stiff, brown **SILTY CLAY**						1	86.24		
						2	85.24		
- firm and grey by 2.5m depth						3	84.24		▽
3.20									
End of Test Pit									
(Groundwater infiltration @ 3.0m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %; scale 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

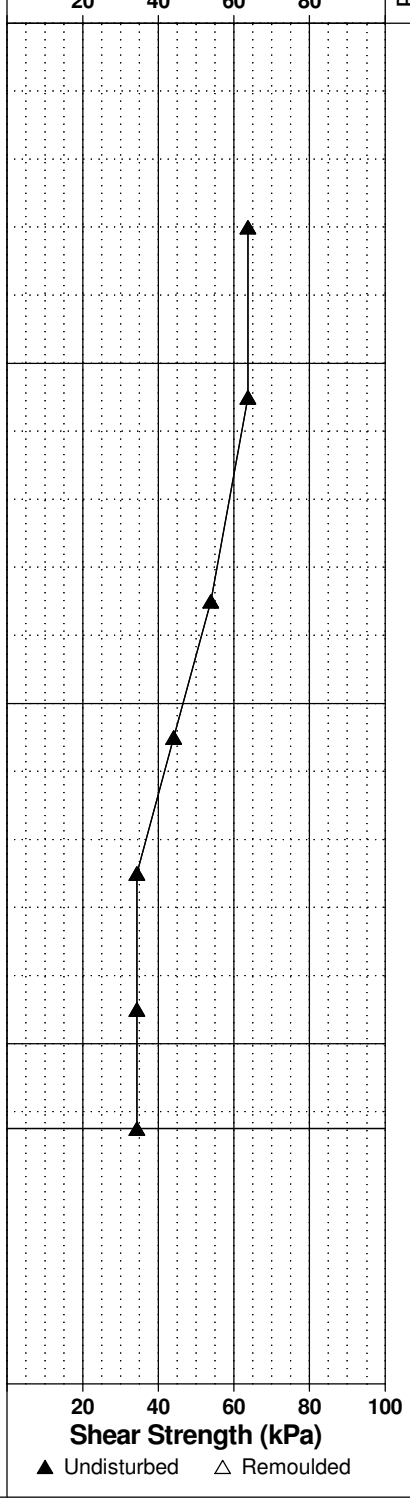
FILE NO. PG0861

REMARKS

HOLE NO. TP21-08

BORINGS BY Backhoe **DATE** October 24, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL						0	86.88		
0.20									
Stiff to firm, brown **SILTY CLAY**, trace silt						1	85.88		
- firm and grey by 2.0m depth						2	84.88		
						3	83.88		
3.25									
End of Test Pit									
(Groundwater infiltration @ 2.3m depth)									



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. TP22-08

BORINGS BY Backhoe **DATE** October 24, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.41	20 40 60 80	
TOPSOIL									
0.20									
Stiff to firm, brown **SILTY CLAY**						1	86.41		▽
- firm and grey by 1.4m depth						2	85.41		
3.00						3	84.41		
End of Test Pit									
(Groundwater infiltration @ 1.2m depth									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. TP23-08

BORINGS BY Backhoe **DATE** October 24, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL						0	87.29		
0.20									
Stiff to firm, brown **SILTY CLAY**						1	86.29		
- firm and grey by 1.4m depth						2	85.29		
						3	84.29		
3.20									
End of Test Pit									
(Groundwater infiltration @ 1.5m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

Water Content % axis: 20, 40, 60, 80

Shear Strength (kPa) axis: 20, 40, 60, 80, 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. TP24-08

BORINGS BY Backhoe **DATE** October 24, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	86.80		
TOPSOIL 0.30									
Brown **SILTY SAND** 0.76						1	85.80		▽
Stiff to firm, brown **SILTY CLAY**									
- soft to firm and grey by 1.6m depth						2	84.80		
2.75 End of Test Pit									
(Groundwater infiltration @ 1.3m depth									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. TP25-08

BORINGS BY Backhoe **DATE** October 24, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL 0.10						0	87.11		
Brown **SILTY SAND** 0.30									
Stiff to firm, brown **SILTY CLAY**						1	86.11		▽
- firm and grey by 1.7m depth						2	85.11		
						3	84.11		
3.20 End of Test Pit									
(Groundwater infiltration @ 1.0m depth)									

Water Content % scale: 20 40 60 80

Shear Strength (kPa) scale: 20 40 60 80 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - Trails Edge East
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG0861

REMARKS

HOLE NO. TP26-08

BORINGS BY Backhoe **DATE** October 24, 2008

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE									
TOPSOIL						0	87.02		
0.25									
Stiff to firm, brown **SILTY CLAY**						1	86.02		
- grey by 2.4m depth						2	85.02		
3.00						3	84.02		
End of Test Pit									
(Groundwater infiltration @ 2.9m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

Water Content % axis: 20, 40, 60, 80

Shear Strength (kPa) axis: 20, 40, 60, 80, 100

▲ Undisturbed △ Remoulded

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

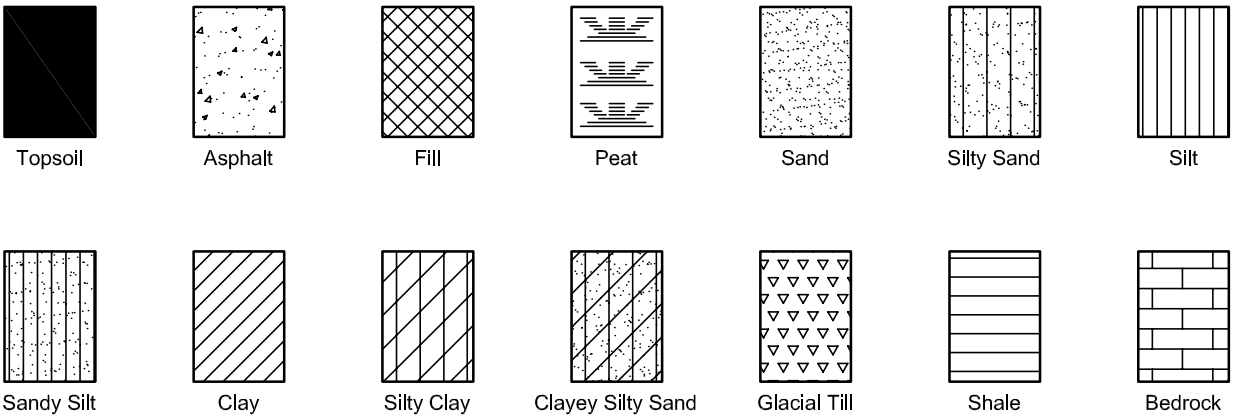
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

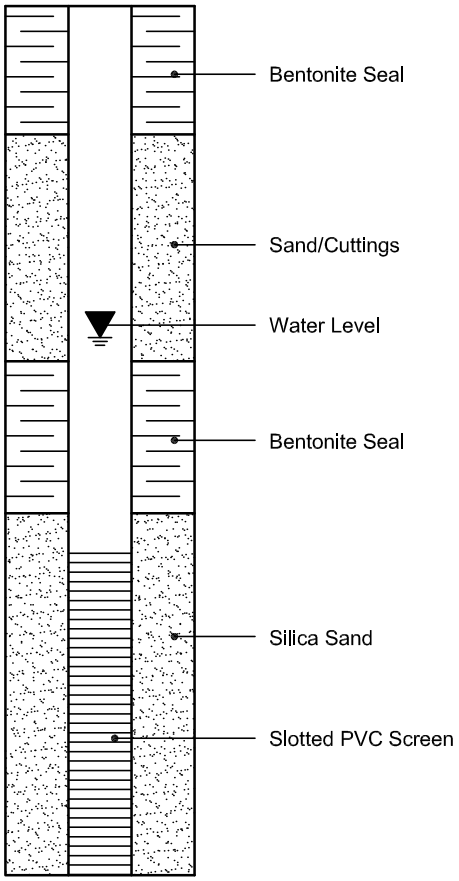
SYMBOLS AND TERMS (continued)

STRATA PLOT

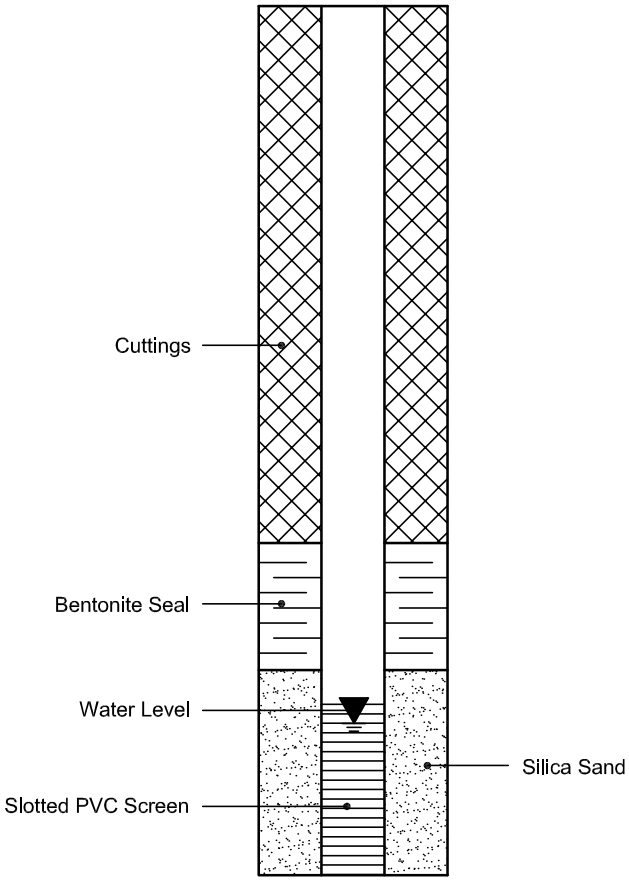


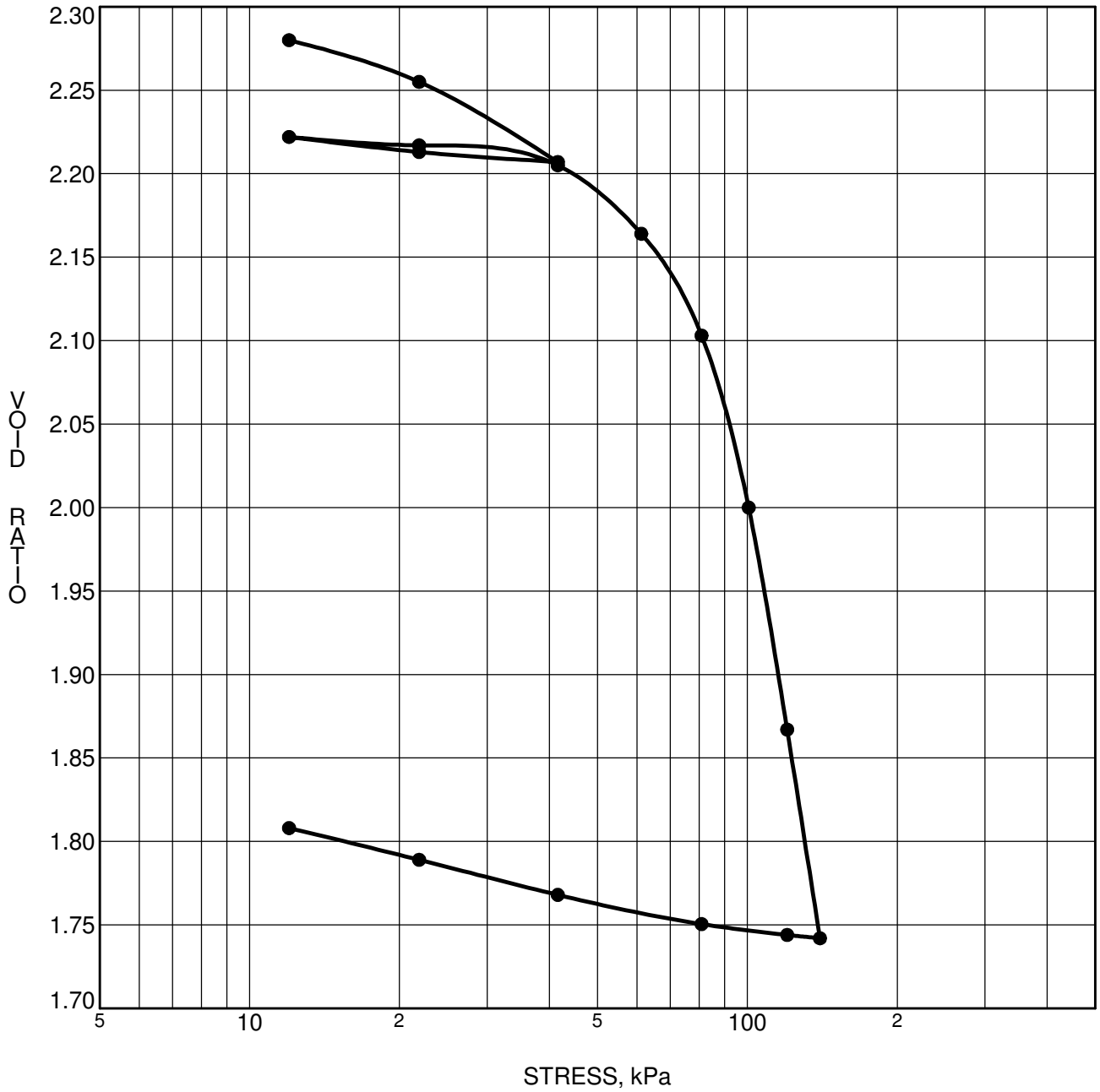
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION





CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH15-08**	p'o	**50** kPa	Ccr	**0.029**
Sample No.	**TW 2**	p'c	**87** kPa	Cc	**1.890**
Sample Depth	**4.91** m	OC Ratio	**1.7**	Wo	**83.8** %
Sample Elev.	**82.33** m	Void Ratio	**2.303**	Unit Wt.	**16.0** kN/m ^{3}

CLIENT	**Richcraft Group of Companies**	FILE NO.	**PG0861**
PROJECT	**Geotechnical Investigation - Prop. Residential Development - Trails Edge East**	DATE	**10/27/08**

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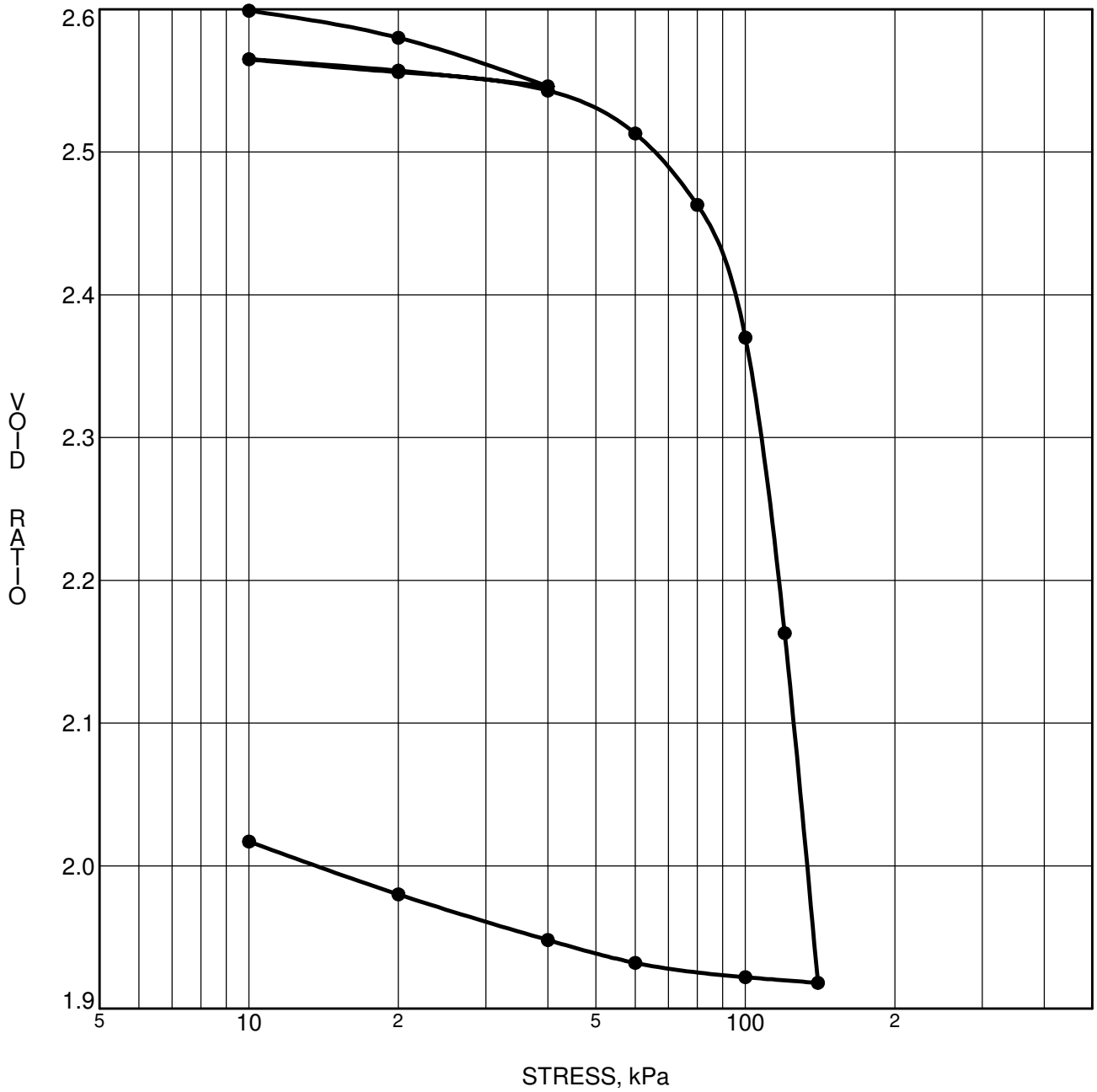
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH17-08**	p'o	**42** kPa	Ccr	**0.034**
Sample No.	**TW 3**	p'c	**100** kPa	Cc	**3.750**
Sample Depth	**4.11** m	OC Ratio	**2.4**	Wo	**95.8** %
Sample Elev.	**83.30** m	Void Ratio	**2.635**	Unit Wt.	**16.0** kN/m ^{3}

CLIENT **Richcraft Group of Companies** FILE NO. **PG0861**

PROJECT **Geotechnical Investigation - Prop. Residential Development - Trails Edge East** DATE **10/21/08**

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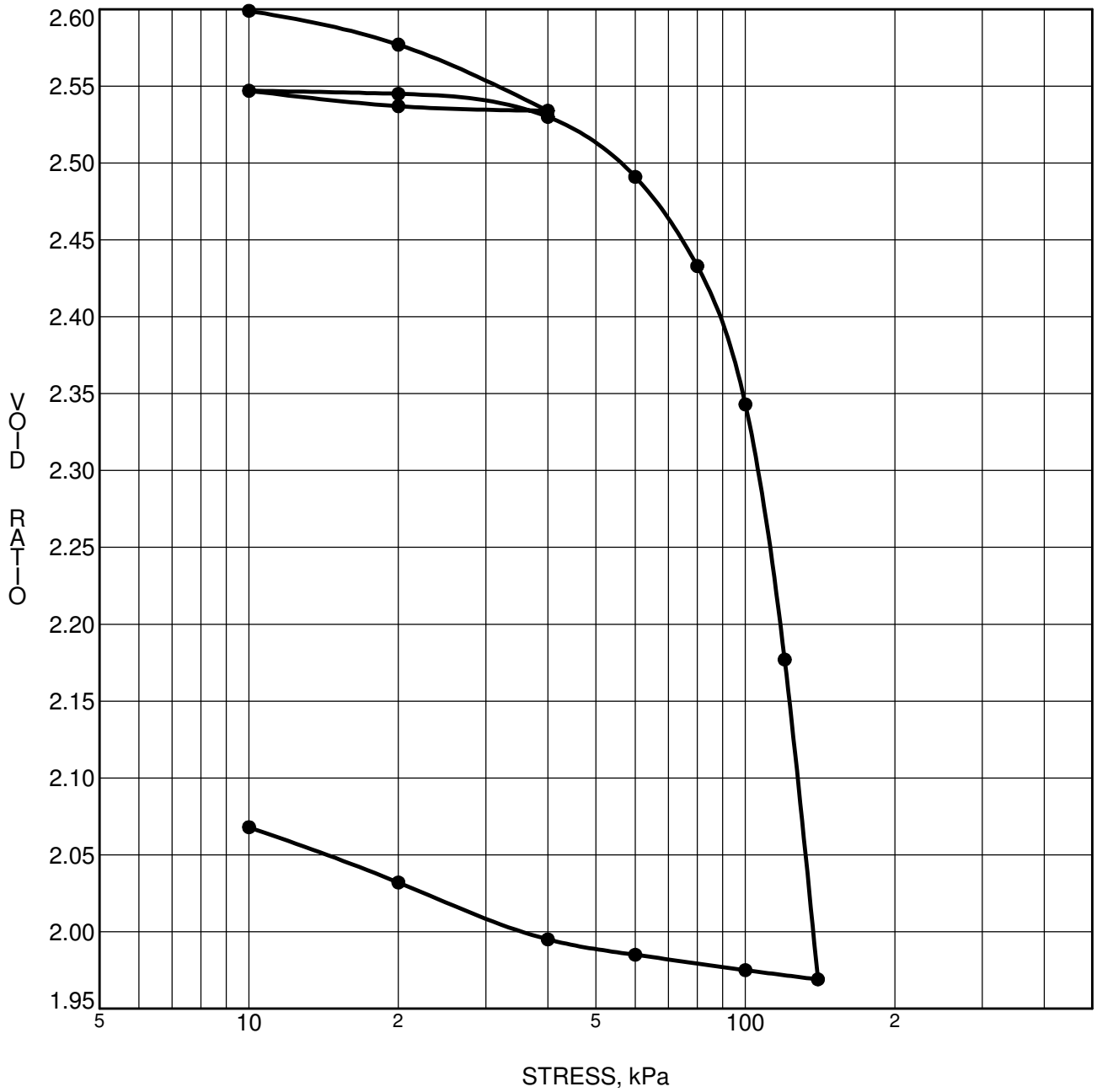
CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH19-08**	p'o	**43** kPa	Ccr	**0.025**
Sample No.	**TW 3**	p'c	**99** kPa	Cc	**3.100**
Sample Depth	**4.90** m	OC Ratio	**2.3**	Wo	**95.1** %
Sample Elev.	**81.90** m	Void Ratio	**2.615**	Unit Wt.	**16.0** kN/m ^{3}

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PROJECT **Geotechnical Investigation - Prop. Residential Development - Trails Edge East** DATE **10/21/08**

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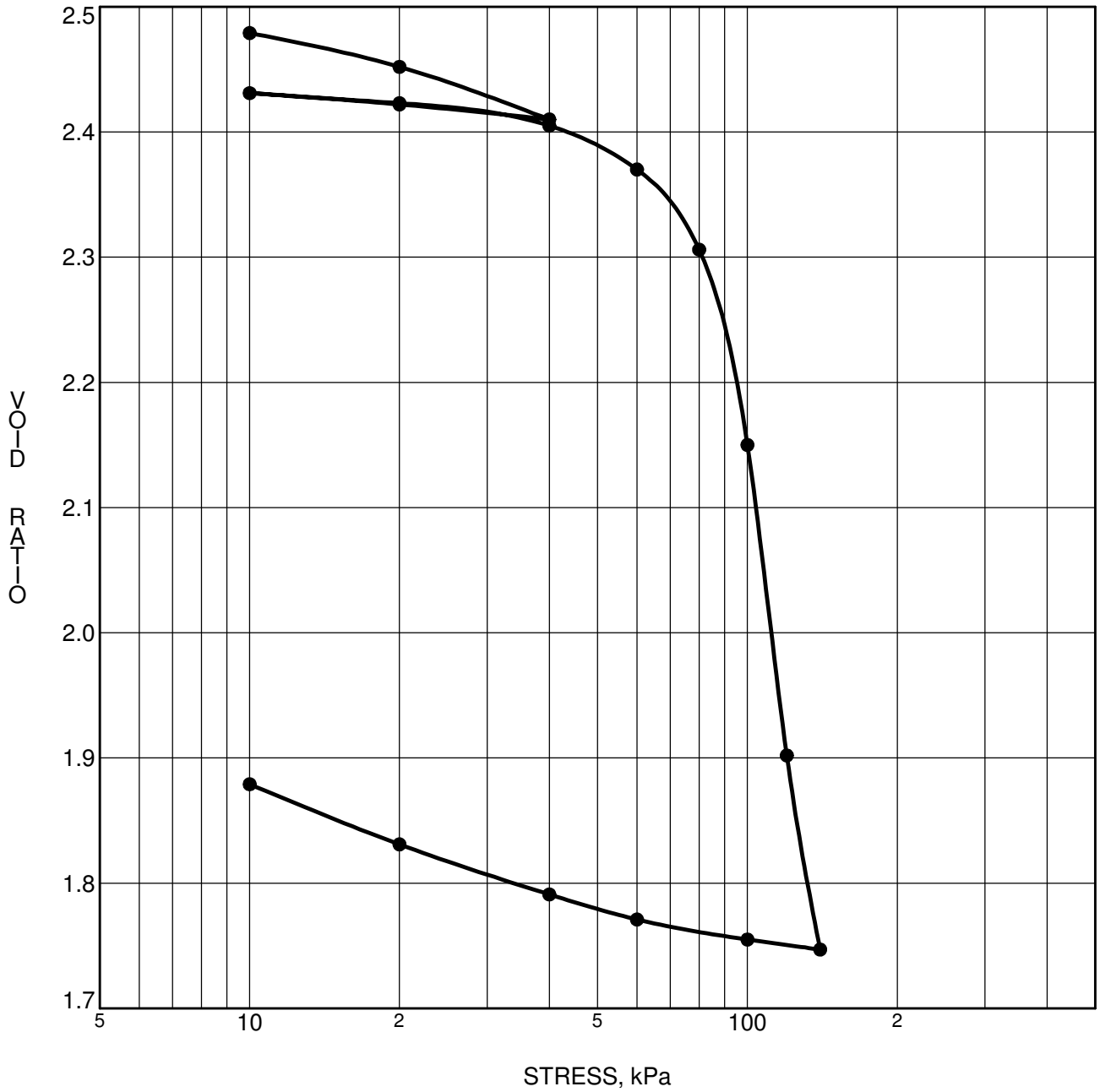
CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH21-08**	p'o	**50** kPa	Ccr	**0.041**
Sample No.	**TW 4**	p'c	**89** kPa	Cc	**3.172**
Sample Depth	**4.19** m	OC Ratio	**1.8**	Wo	**91.3** %
Sample Elev.	**82.83** m	Void Ratio	**2.511**	Unit Wt.	**16.0** kN/m ^{3}

CLIENT	**Richcraft Group of Companies**	FILE NO.	**PG0861**
PROJECT	**Geotechnical Investigation - Prop. Residential Development - Trails Edge East**	DATE	**10/21/08**

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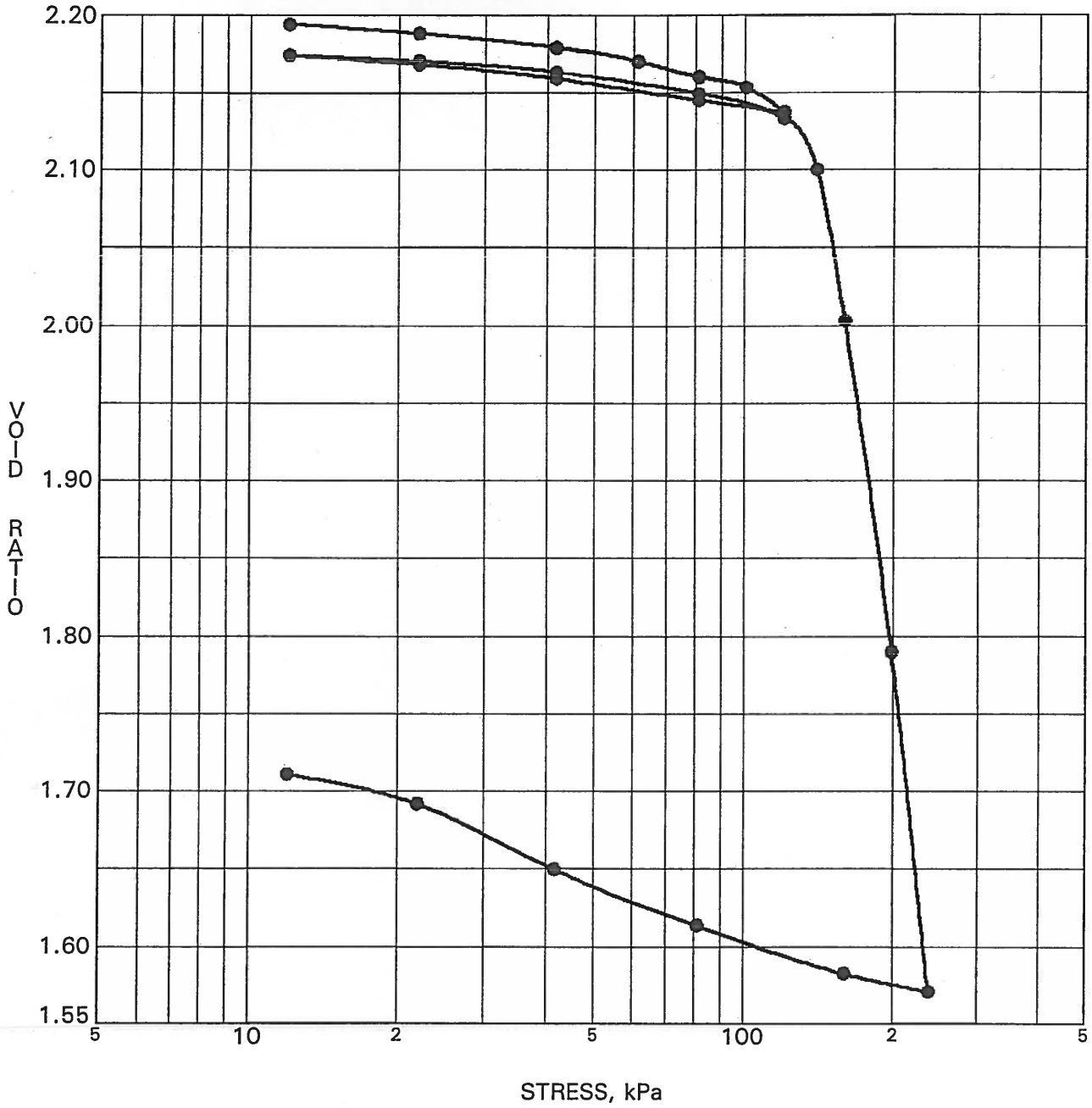
CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	BH 3	p'_o	47 kPa	Ccr	0.048
Sample No.	TW 3	p'_c	145 kPa	Cc	2.478
Sample Depth	3.48 m	OC Ratio	3.1	Wo	79.6 %
Sample Elev.	84.02 m	Void Ratio	2.202	Unit Wt.	15.2 kN/m^3

CLIENT	Richcraft Homes	FILE NO.	G8533
PROJECT	Geotechnical Investigation - Proposed Residential Subdivision, 4th Line Road	DATE	20/03/02

CONSOLIDATION TEST

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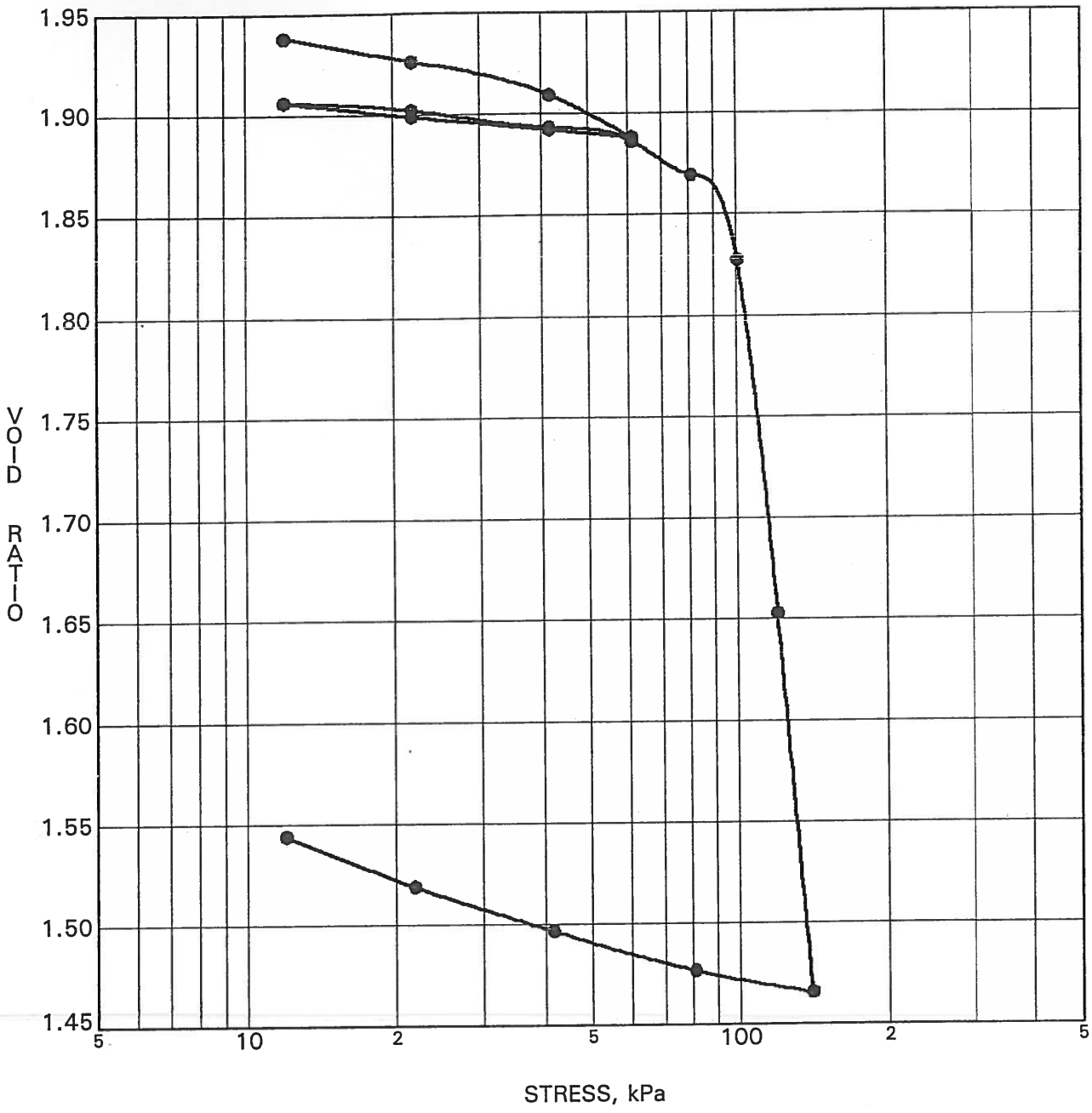
Unit 1, 28 Concourse Gate, Nepean, Ontario K2E 7T7



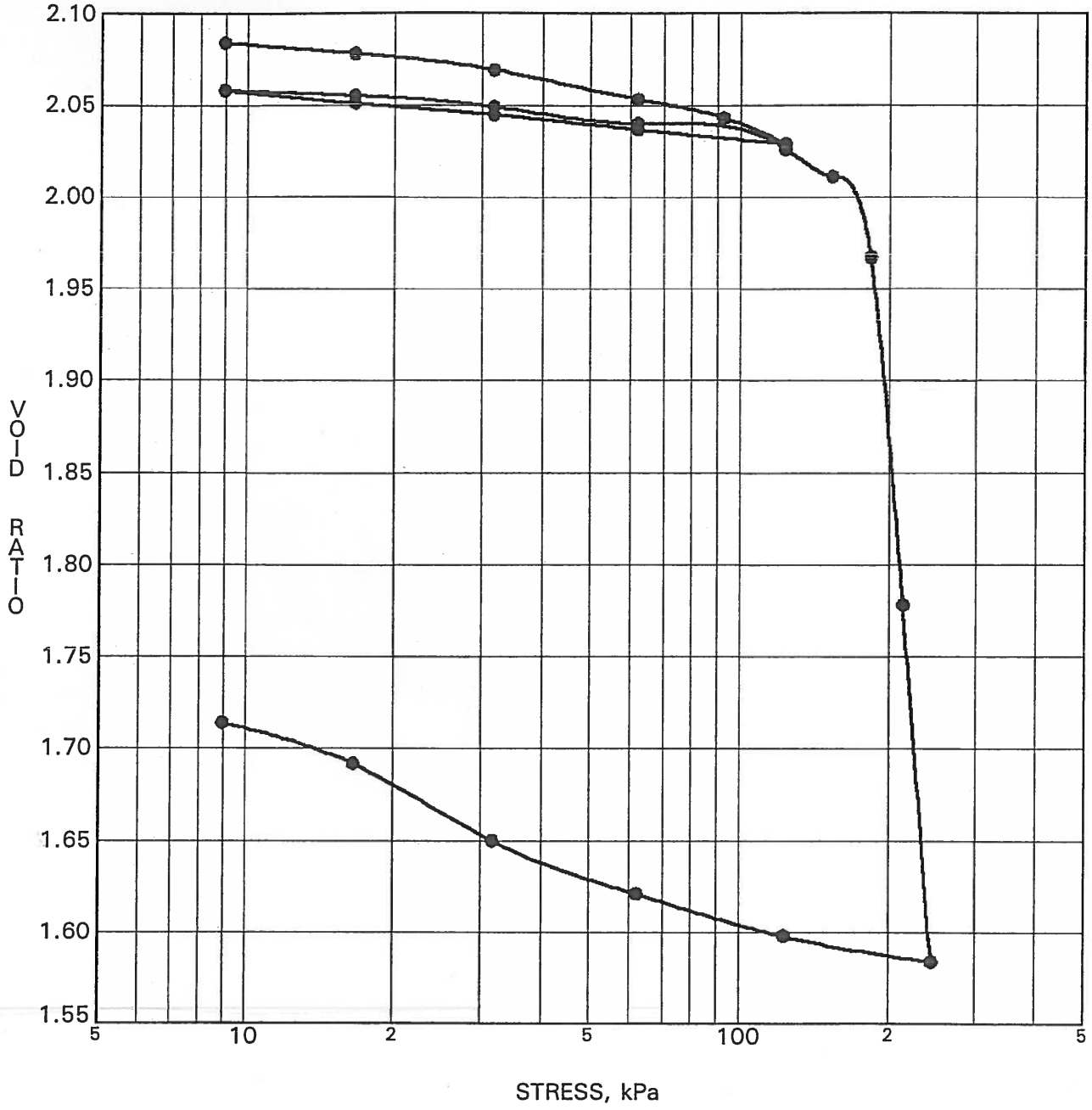
CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	BH 3	p'_o	64 kPa	Ccr	0.043
Sample No.	TW 5	p'_c	103 kPa	Cc	2.967
Sample Depth	6.53 m	OC Ratio	1.6	Wo	70.8 %
Sample Elev.	80.97 m	Void Ratio	1.951	Unit Wt.	14.9 kN/m^3

CLIENT **Richcraft Homes** FILE NO. **G8533**

PROJECT **Geotechnical Investigation - Proposed Residential Subdivision, 4th Line Road** DATE **20/03/02**

CONSOLIDATION TEST

JOHN D. PATERSON & ASSOCIATES LTD.
Unit 1, 28 Concourse Gate, Nepean, Ontario K2E 7T7

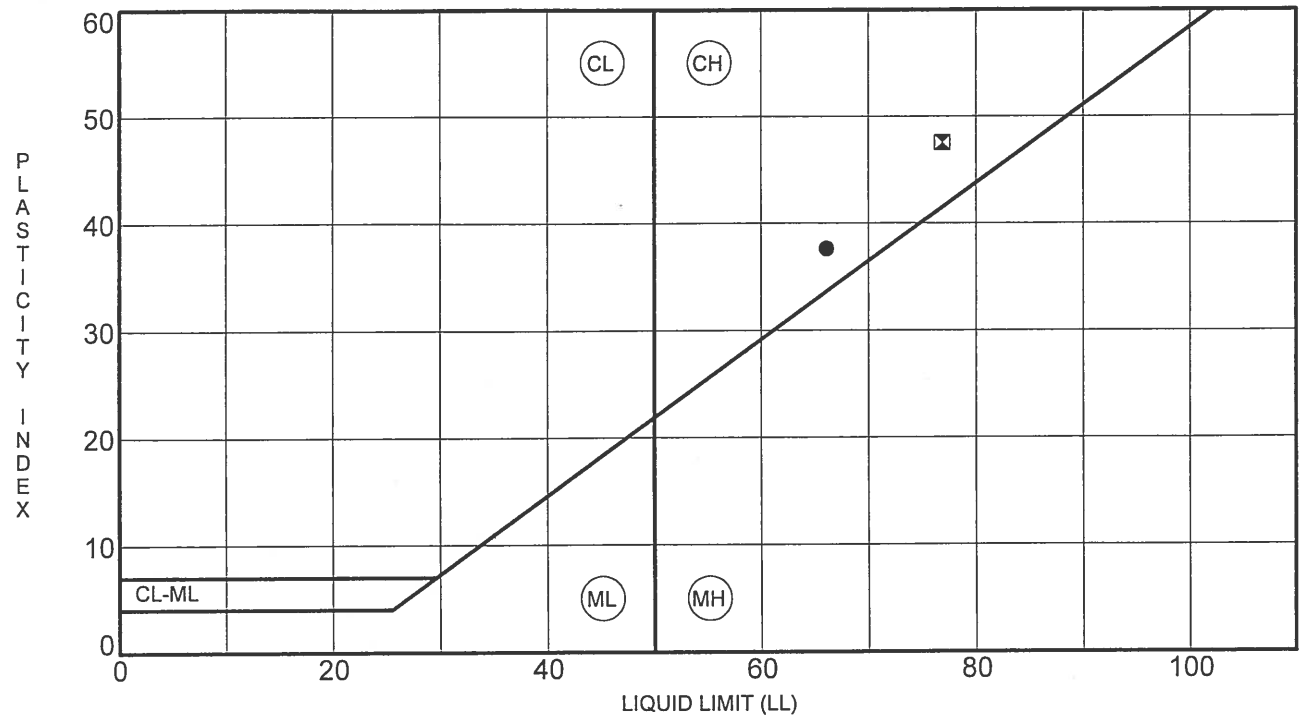


CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	BH 3	p'_o	82 kPa	Ccr	0.028
Sample No.	TW 7	p'_c	175 kPa	Cc	3.046
Sample Depth	9.60 m	OC Ratio	2.1	Wo	75.9 %
Sample Elev.	77.90 m	Void Ratio	2.084	Unit Wt.	15.4 kN/m^3

CLIENT	Richcraft Homes	FILE NO.	G8533
PROJECT	Geotechnical Investigation - Proposed Residential Subdivision, 4th Line Road	DATE	20/03/02

CONSOLIDATION TEST

JOHN D. PATERSON & ASSOCIATES LTD.
Unit 1, 28 Concourse Gate, Nepean, Ontario K2E 7T7



Specimen Identification	LL	PL	PI	Fines	Classification
● BH15-08	66	28	38		CH-Inorganic Clays of High Plasticity (TW2)
⊠ BH17-08	77	29	48		CH-Inorganic Clays of High Plasticity (TW3)

CLIENT **Richcraft Homes**

PROJECT **Geotechnical Investigation - Residential Development - Eden Park East Portion**

FILE NO. **PG0861**

DATE **15 Oct 08**

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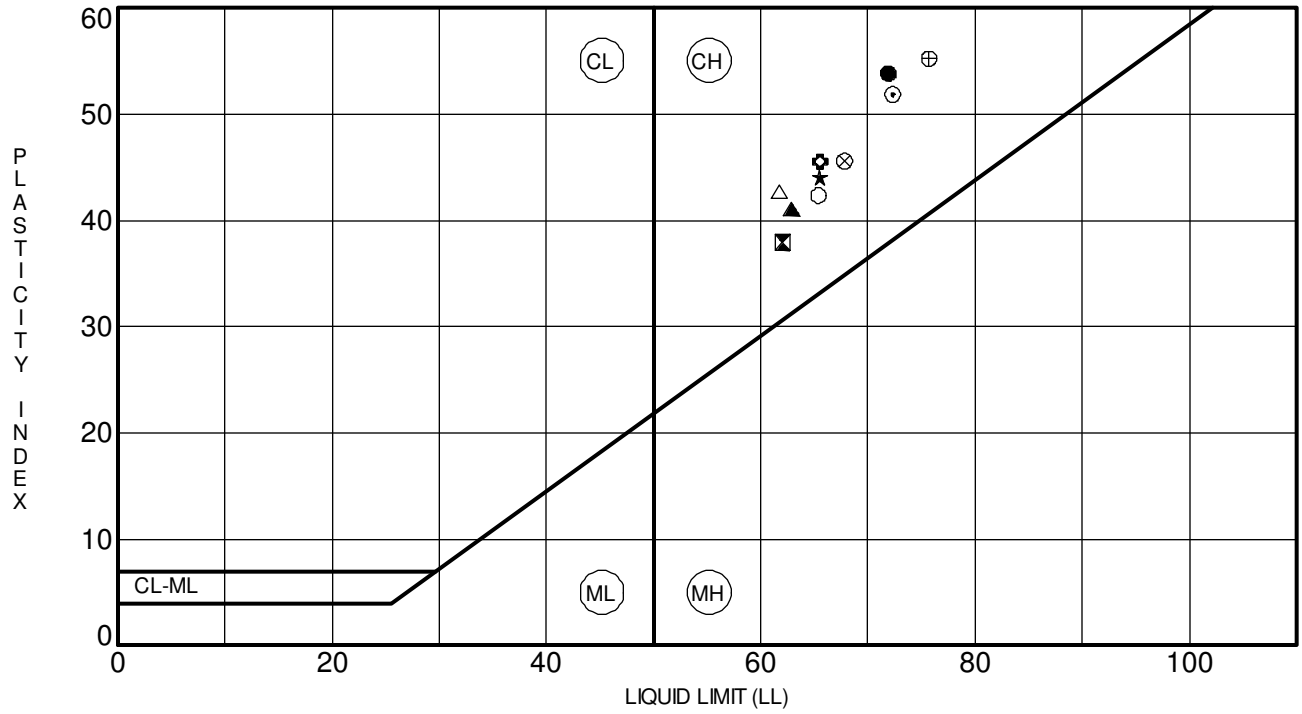
28 Concouse Gate, Unit 1, Ottawa, Ontario K2E 7T7

ATTERBERG LIMITS' RESULTS



	Specimen Identification	LL	PL	PI	Fines	Classification
●	**TP 1-18**	**72**	**18**	**54**		**CH - Inorganic clays of high plasticity**
⊠	**TP 2-18**	**62**	**24**	**38**		**CH - Inorganic clays of high plasticity**
▲	**TP 3-18**	**63**	**22**	**41**		**CH - Inorganic clays of high plasticity**
★	**TP 4-18**	**66**	**21**	**44**		**CH - Inorganic clays of high plasticity**
⊙	**TP 5-18**	**72**	**20**	**52**		**CH - Inorganic clays of high plasticity**
✿	**TP 6-18**	**66**	**20**	**46**		**CH - Inorganic clays of high plasticity**
○	**TP 7-18**	**65**	**23**	**42**		**CH - Inorganic clays of high plasticity**
△	**TP 8-18**	**62**	**19**	**43**		**CH - Inorganic clays of high plasticity**
⊗	**TP 9-18**	**68**	**22**	**46**		**CH - Inorganic clays of high plasticity**
⊕	**TP10-18**	**76**	**20**	**55**		**CH - Inorganic clays of high plasticity**

CLIENT **Richcraft Homes** FILE NO. **PG0861**

PROJECT **Geotechnical Investigation - Trails Edge East** DATE **10 Jul 18**

Residential Development - Renaud Road

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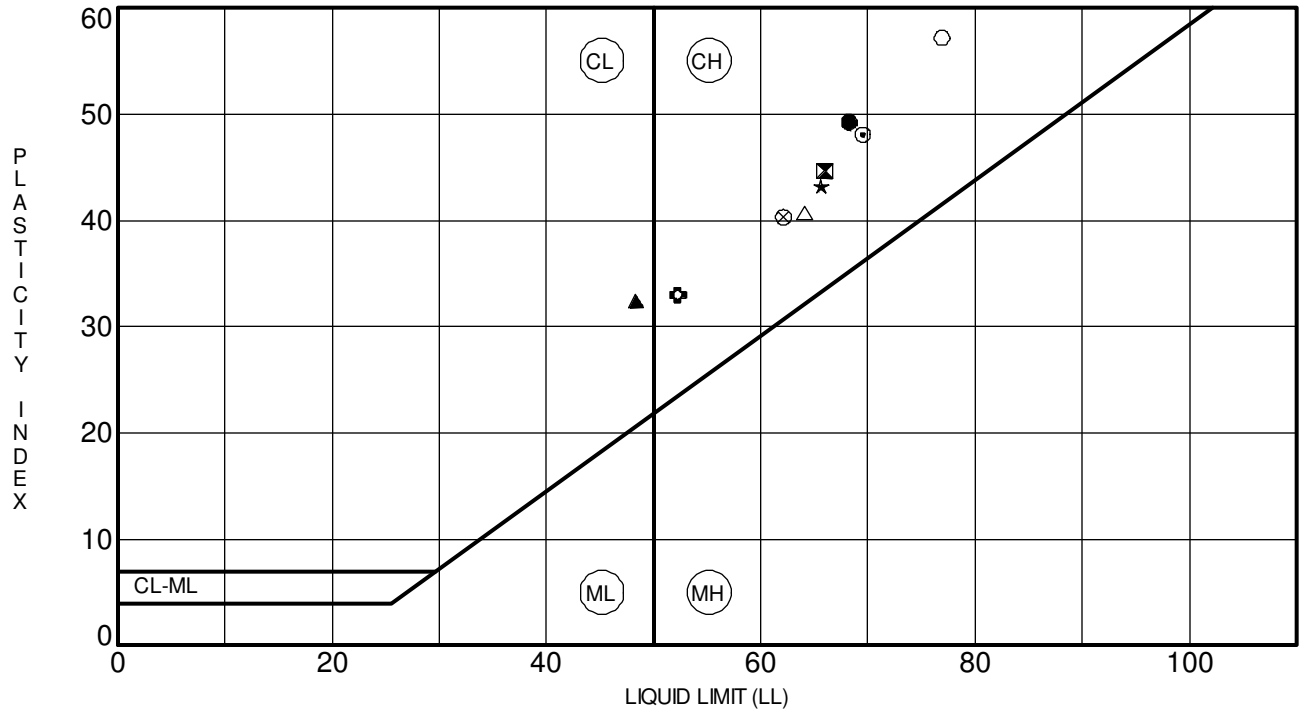
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

ATTERBERG LIMITS' RESULTS



	Specimen Identification	LL	PL	PI	Fines	Classification
●	**TP11-18**	**68**	**19**	**49**		**CH - Inorganic clays of high plasticity**
⊠	**TP12-18**	**66**	**21**	**45**		**CH - Inorganic clays of high plasticity**
▲	**TP13-18**	**48**	**16**	**32**		**CL - Inorganic clays of low plasticity**
★	**TP14-18**	**66**	**22**	**43**		**CH - Inorganic clays of high plasticity**
⊙	**TP15-18**	**70**	**21**	**48**		**CH - Inorganic clays of high plasticity**
✿	**TP16-18**	**52**	**19**	**33**		**CH - Inorganic clays of high plasticity**
○	**TP17-18**	**77**	**20**	**57**		**CH - Inorganic clays of high plasticity**
△	**TP18-18**	**64**	**23**	**41**		**CH - Inorganic clays of high plasticity**
⊗	**TP19-18**	**62**	**22**	**40**		**CH - Inorganic clays of high plasticity**

CLIENT **Richcraft Homes** FILE NO. **PG0861**

PROJECT **Geotechnical Investigation - Trails Edge East** DATE **10 Jul 18**

Residential Development - Renaud Road

patersongroup Consulting Engineers

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ATTERBERG LIMITS' RESULTS

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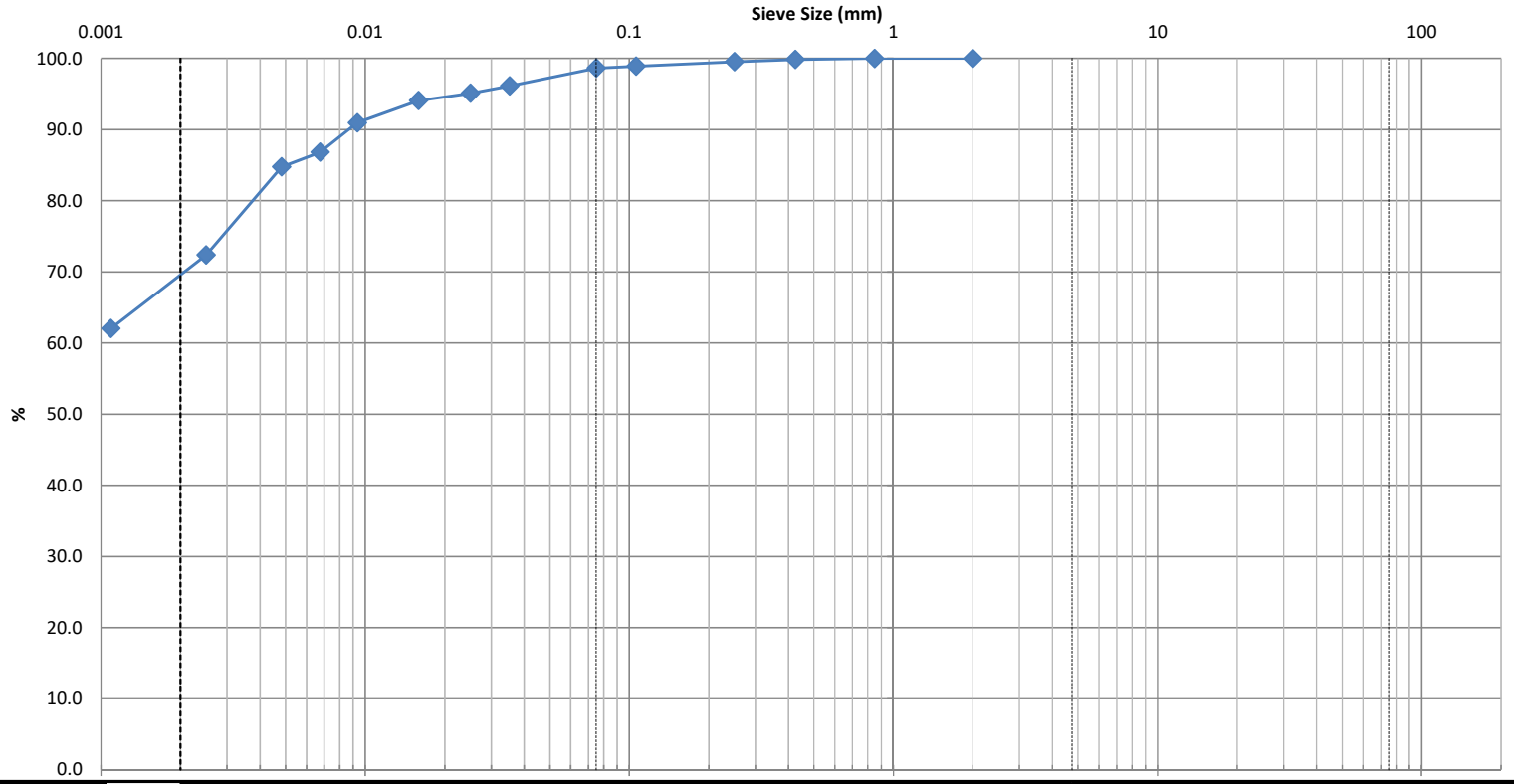
CLIENT:	Richcraft Homes	DEPTH:	86.1	FILE NO:	PG0861
CONTRACT NO.:		BH OR TP No.:	TP2-18	LAB NO:	2157
PROJECT:	Trails Edge East			DATE RECEIVED:	12-Jul-18
				DATE TESTED:	16-Jul-18
DATE SAMPLED:	11-Jul-18			DATE REPORTED:	18-Jul-18
SAMPLED BY:	G. Richardson			TESTED BY:	D. Bertrand



	Clay	Silt	Sand			Gravel		Cobble
			Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
	CH - Inorganic clays of high plasticity	26					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	1.4	29.1	69.5

Comments	

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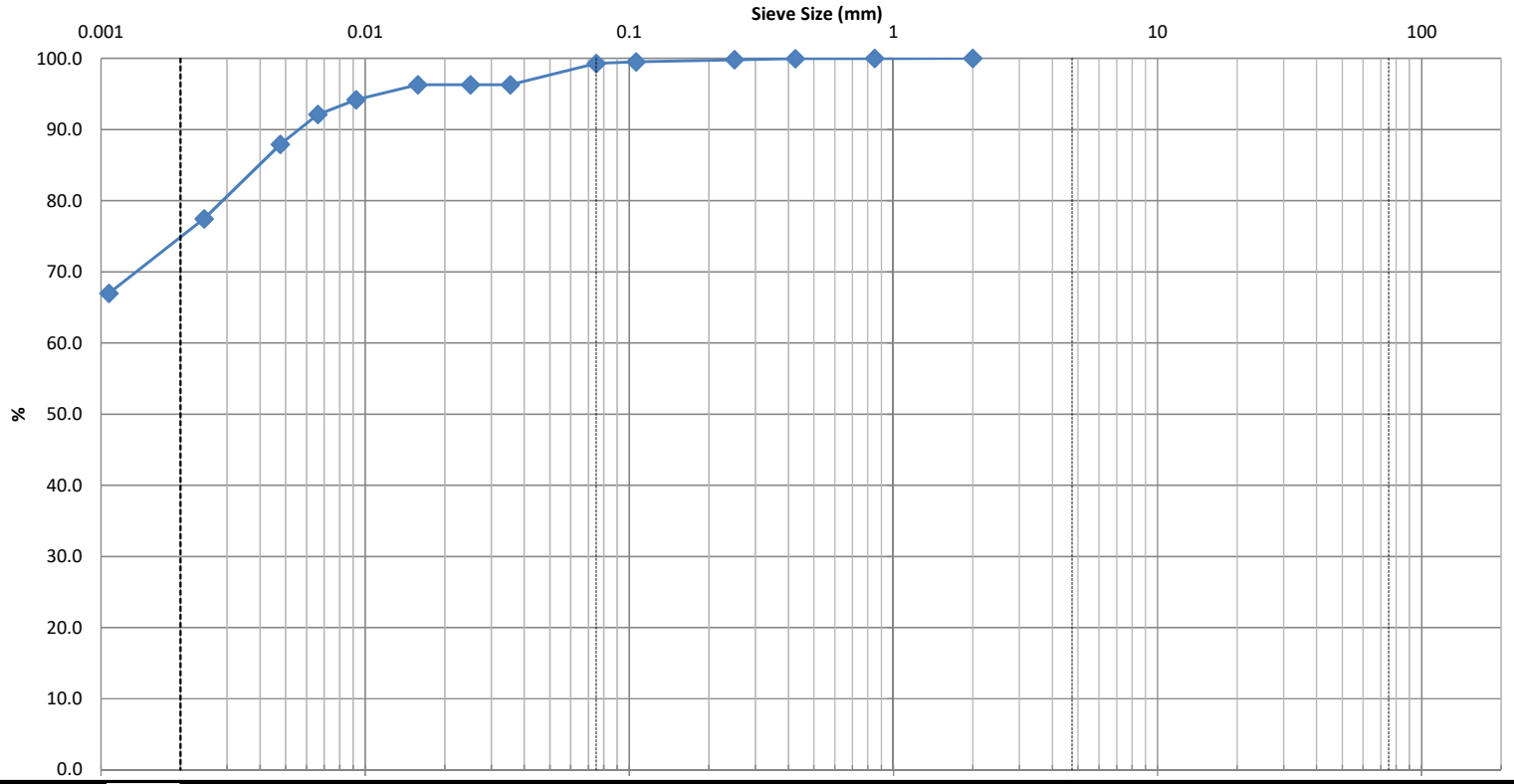
CLIENT:	Richcraft Homes	DEPTH:	86.8	FILE NO:	PG0861
CONTRACT NO.:		BH OR TP No.:	TP7-18	LAB NO:	2159
PROJECT:	Trails Edge East			DATE RECEIVED:	12-Jul-18
				DATE TESTED:	16-Jul-18
DATE SAMPLED:	11-Jul-18			DATE REPORTED:	18-Jul-18
SAMPLED BY:	G. Richardson			TESTED BY:	D. Bertrand



	Clay	Silt	Sand			Gravel		Cobble
			Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
	CH - Inorganic clays of high plasticity	29.9					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	0.7	24.8	74.5

Comments	

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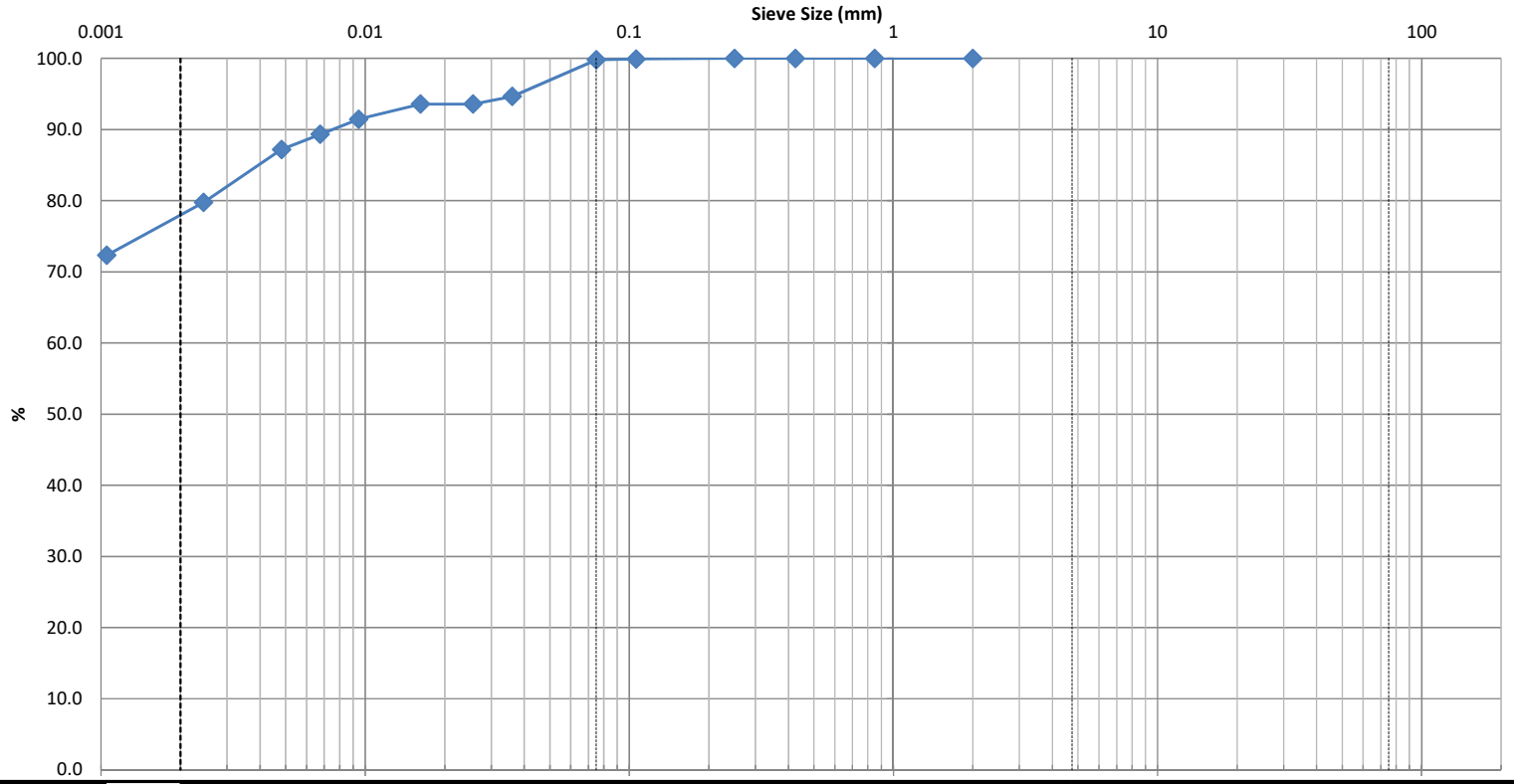
CLIENT:	Richcraft Homes	DEPTH:	86.08	FILE NO:	PG0861
CONTRACT NO.:		BH OR TP No.:	TP10-18	LAB NO:	2160
PROJECT:	Trails Edge East			DATE RECEIVED:	12-Jul-18
				DATE TESTED:	16-Jul-18
DATE SAMPLED:	11-Jul-18			DATE REPORTED:	18-Jul-18
SAMPLED BY:	G. Richardson			TESTED BY:	D. Bertrand



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
	CH - Inorganic clays of high plasticity	33.1					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	0.2	21.3	78.5

Comments	

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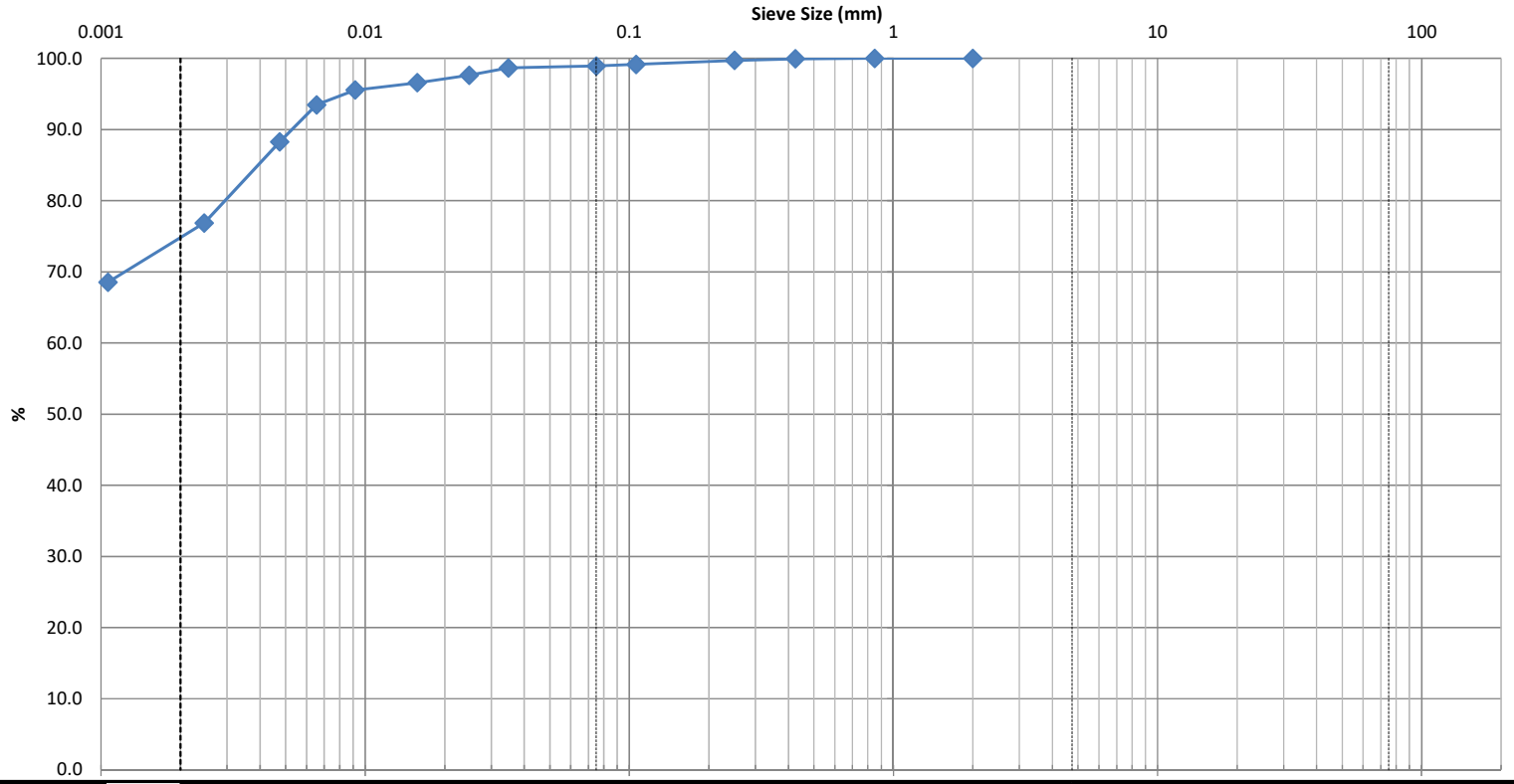
CLIENT:	Richcraft Homes	DEPTH:	86.5	FILE NO:	PG0861
CONTRACT NO.:		BH OR TP No.:	TP12-18	LAB NO:	2162
PROJECT:	Trails Edge East			DATE RECEIVED:	12-Jul-18
				DATE TESTED:	16-Jul-18
DATE SAMPLED:	11-Jul-18			DATE REPORTED:	18-Jul-18
SAMPLED BY:	G. Richardson			TESTED BY:	D. Bertrand



	Clay	Silt	Sand			Gravel		Cobble
			Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
	CH - Inorganic clays of high plasticity	27.7					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	1.1	23.9	75.0

Comments	

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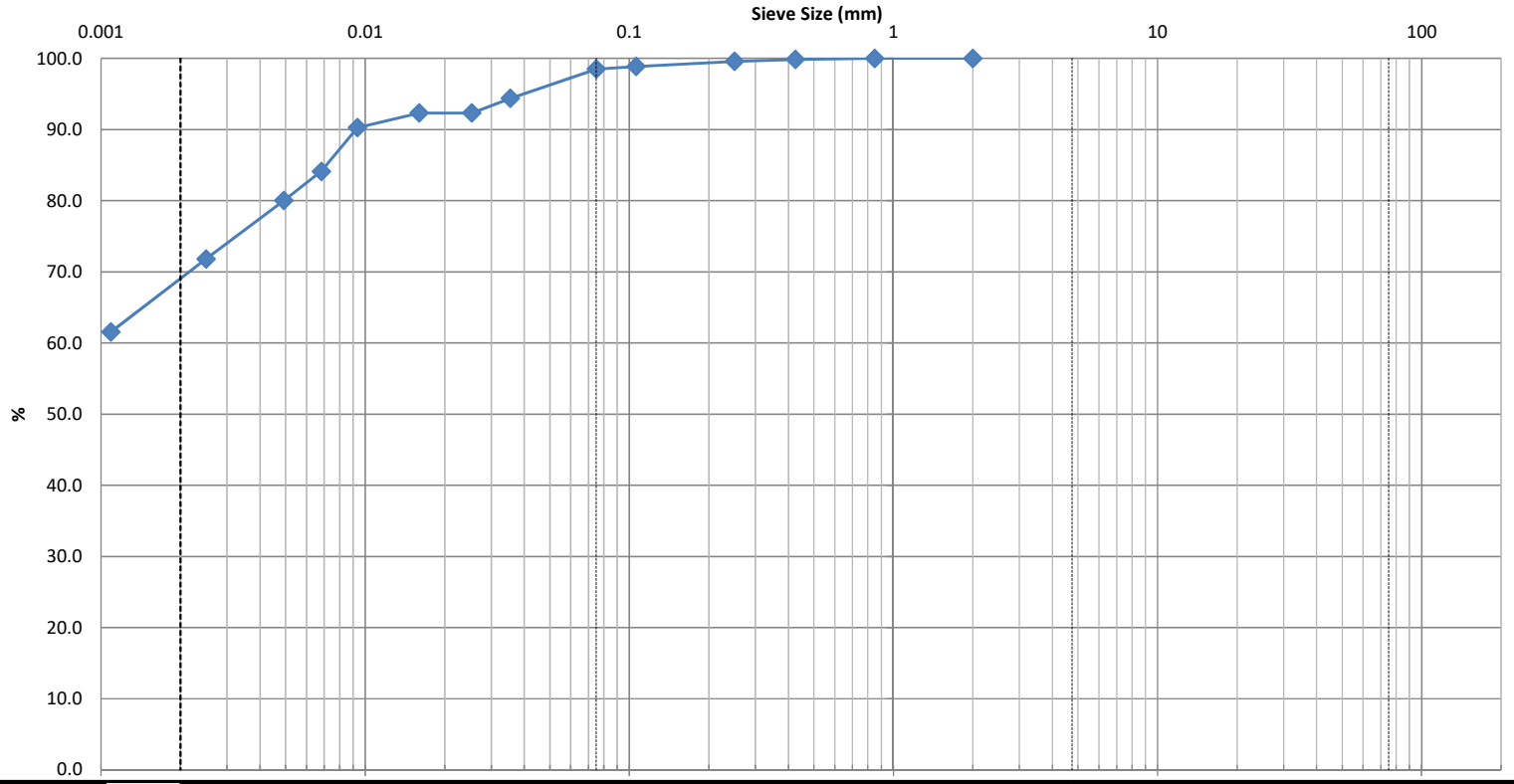
CLIENT:	Richcraft Homes	DEPTH:	86.9	FILE NO:	PG0861
CONTRACT NO.:		BH OR TP No.:	TP17-18	LAB NO:	2161
PROJECT:	Trails Edge East			DATE RECEIVED:	12-Jul-18
				DATE TESTED:	16-Jul-18
DATE SAMPLED:	11-Jul-18			DATE REPORTED:	18-Jul-18
SAMPLED BY:	G. Richardson			TESTED BY:	D. Bertrand



	Clay	Silt	Sand			Gravel		Cobble
			Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
	CH - Inorganic clays of high plasticity	23.6					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	1.5	29.0	69.5

Comments	

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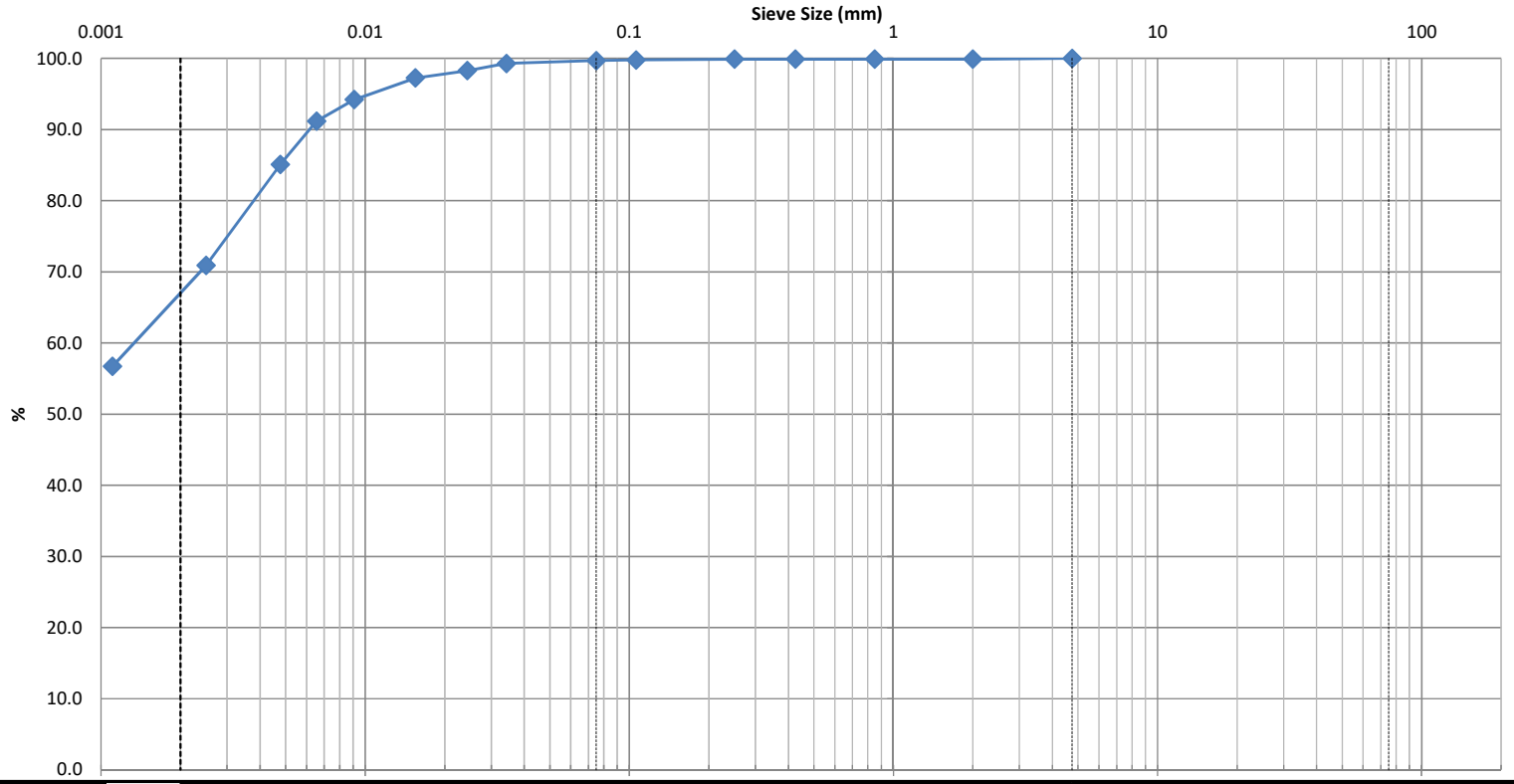
consulting engineers

CLIENT:	Richcraft Homes	DEPTH:	86.1	FILE NO:	PG0861
CONTRACT NO.:		BH OR TP No.:	TP19-18	LAB NO:	2158
PROJECT:	Trails Edge East			DATE RECEIVED:	12-Jul-18
				DATE TESTED:	16-Jul-18
DATE SAMPLED:	11-Jul-18			DATE REPORTED:	18-Jul-18
SAMPLED BY:	G. Richardson			TESTED BY:	D. Bertrand



	Clay	Silt	Sand			Gravel		Cobble
			Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
	CH - Inorganic clays of high plasticity	29.6					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	0.3	22.2	77.5

Comments	

Paracel Laboratories Ltd.

Certificate of Analysis

Order #: H8182

Report Date: 03/28/02
Order Date: 03/19/02
Sample Date: 03/19/02

Client: **J.D. Paterson and Associates**

Client Ref: **6140**

Project: **G8533**

Matrix: Soil		BH2-SS3
Parameter	MDL	H8182.1
Chloride	5.0 ug/g	15
pH	0.050 pH units	9.1
Sulphate	5.0 ug/g	150
Resistivity	0.10 ohm.m	13

APPENDIX 2

FIGURE 1 - KEY PLAN

FIGURE 2 – SURCHARGE MONITORING PROGRAM – PHASE 1

FIGURE 3 – SURCHARGE MONITORING PROGRAM – PHASE 2

FIGURE 4 – SURCHARGE MONITORING PROGRAM – PHASE 2 & 3

FIGURE 5 – SURCHARGE MONITORING PROGRAM – PHASE 3

DRAWING PG0861-6 – TEST HOLE LOCATION PLAN

DRAWING PG0861-7 – TREE PLANTING SETBACK RECOMMENDATIONS

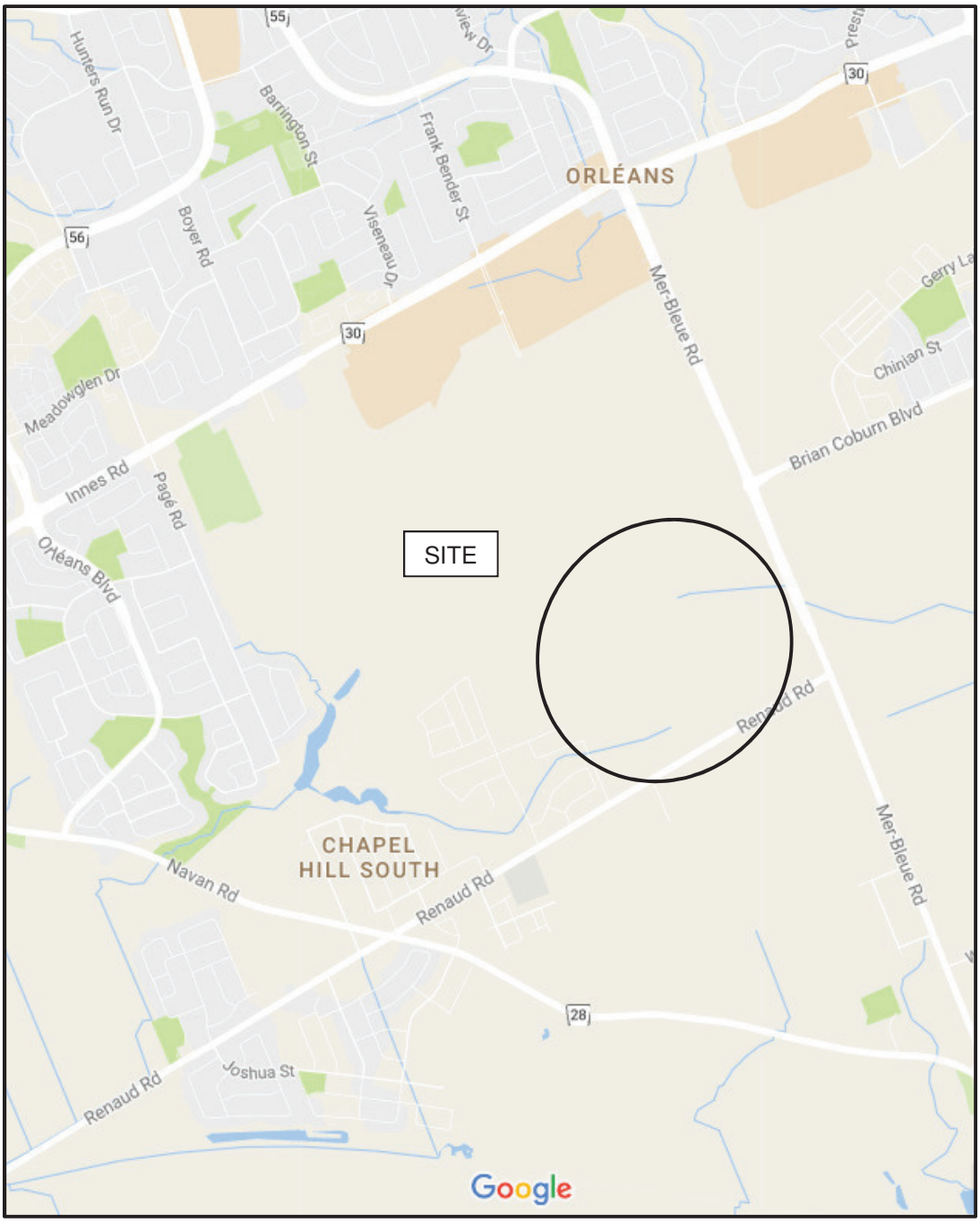


FIGURE 1

KEY PLAN

Figure 2 - Surcharge Monitoring Program - Phase 1
Trails Edge East - Proposed Residential Development - Renaud Road

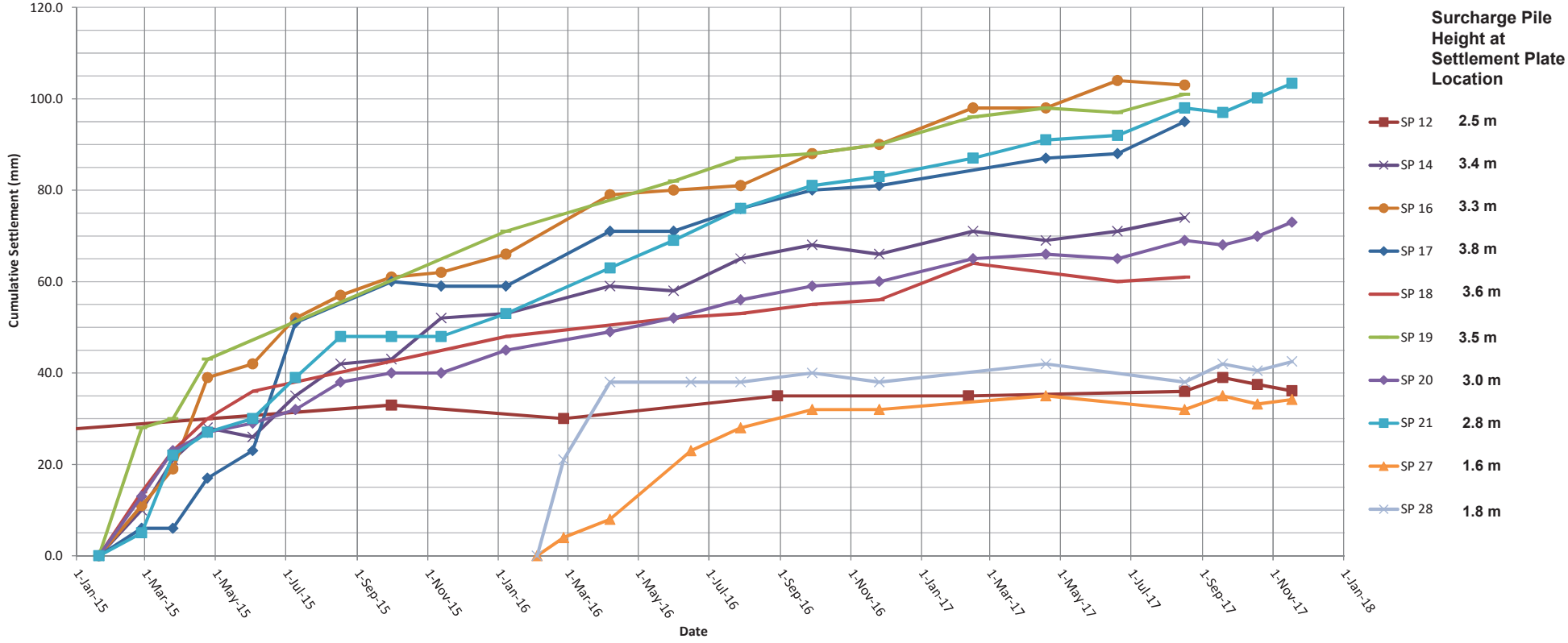
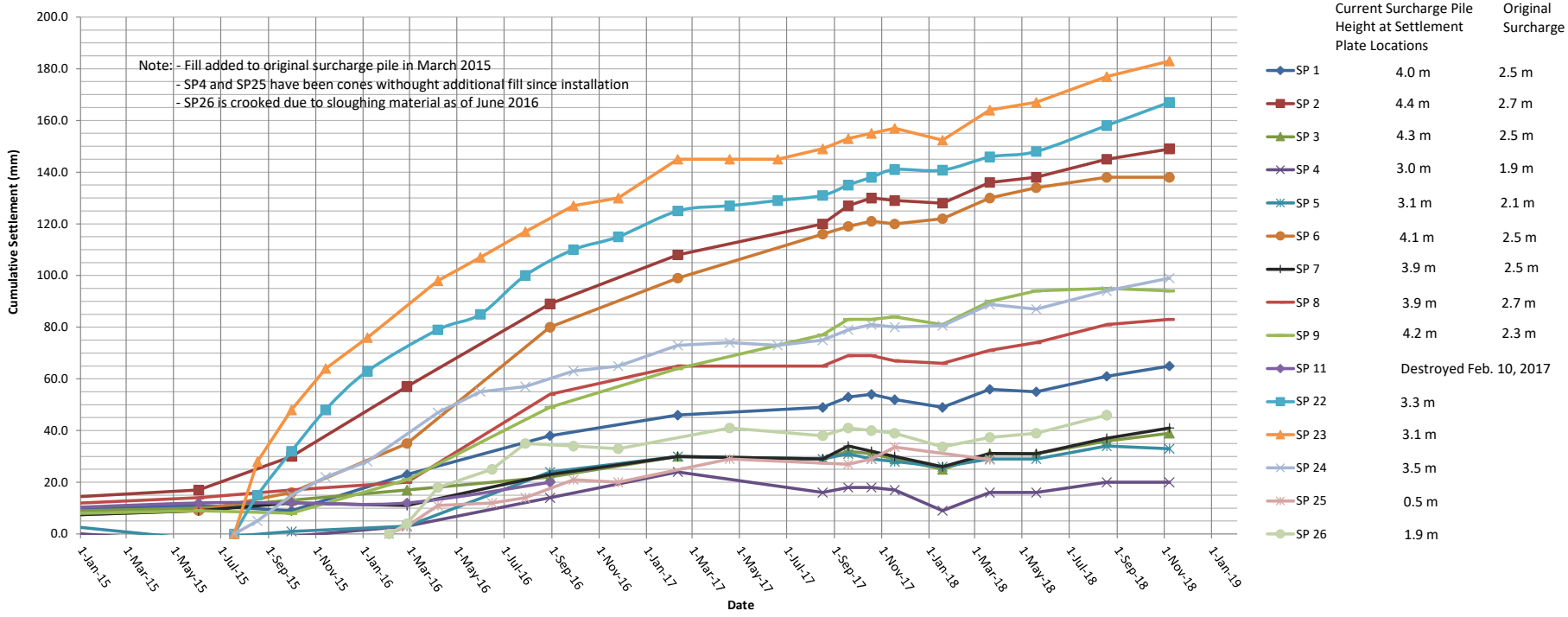


Figure 3 - Surcharge Monitoring Program - Phase 2
Trails Edge East - Proposed Residential Development - Renaud Road



	Current Surcharge Pile Height at Settlement Plate Locations	Original Surcharge
SP 1	4.0 m	2.5 m
SP 2	4.4 m	2.7 m
SP 3	4.3 m	2.5 m
SP 4	3.0 m	1.9 m
SP 5	3.1 m	2.1 m
SP 6	4.1 m	2.5 m
SP 7	3.9 m	2.5 m
SP 8	3.9 m	2.7 m
SP 9	4.2 m	2.3 m
SP 11	Destroyed Feb. 10, 2017	
SP 22	3.3 m	
SP 23	3.1 m	
SP 24	3.5 m	
SP 25	0.5 m	
SP 26	1.9 m	

Figure 4 - Surcharge Monitoring Program - Phase 2 and 3 (Completed Portion)
Trails Edge East - Proposed Residential Development - Renaud Road

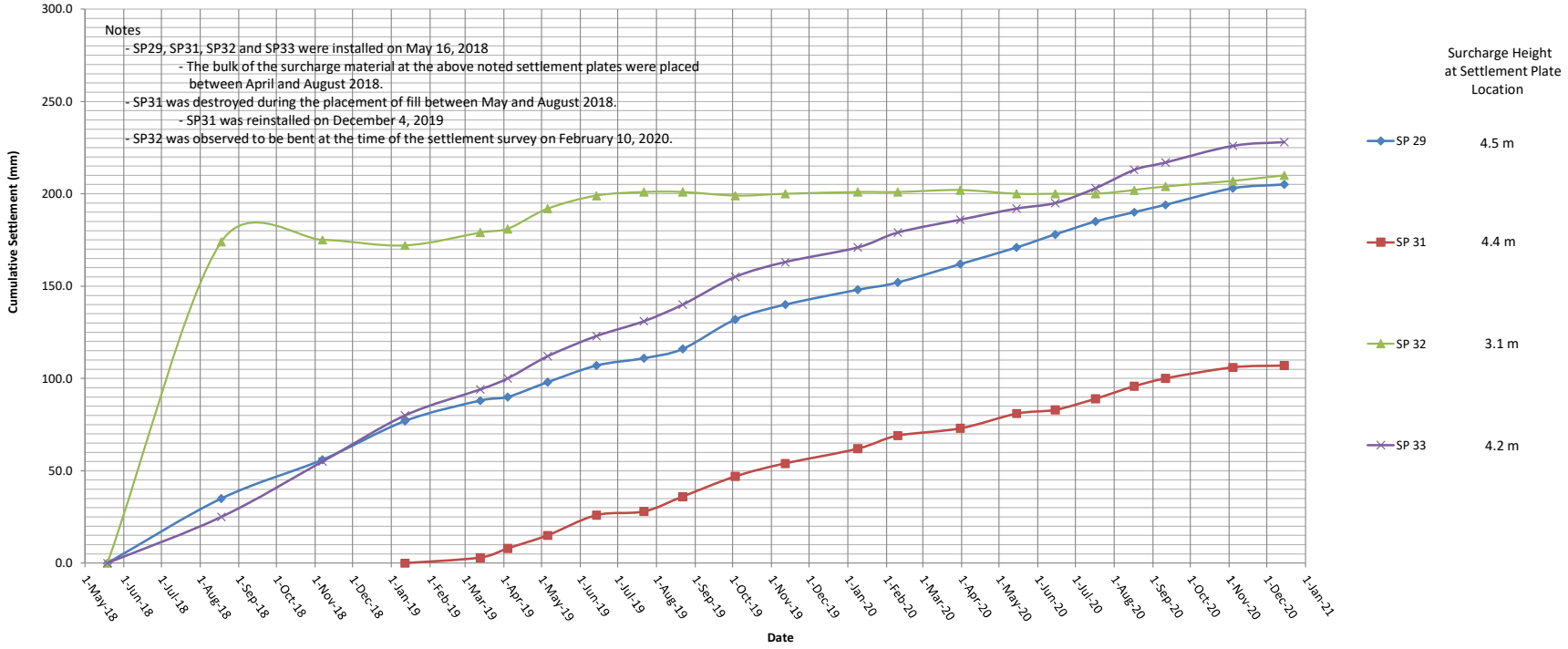
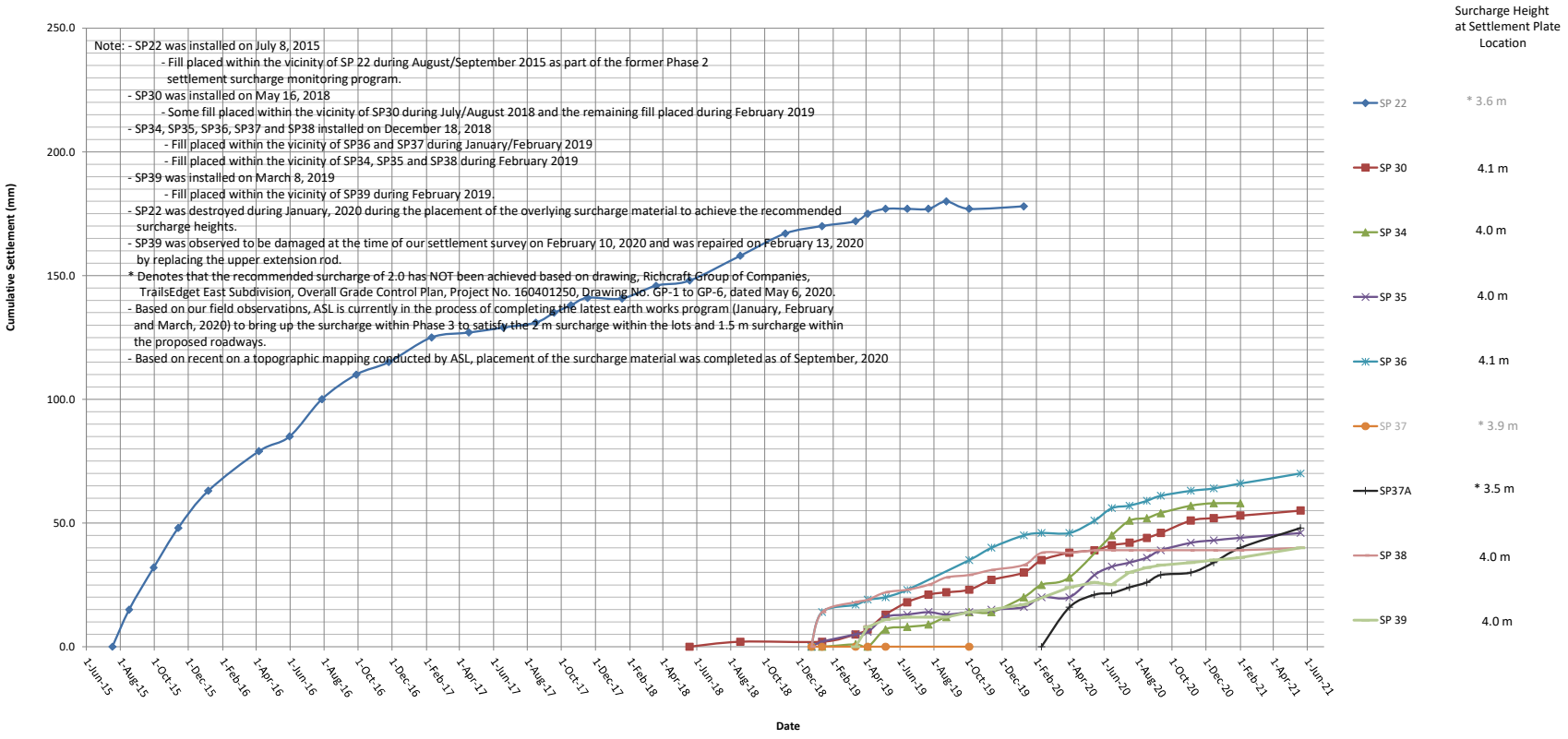
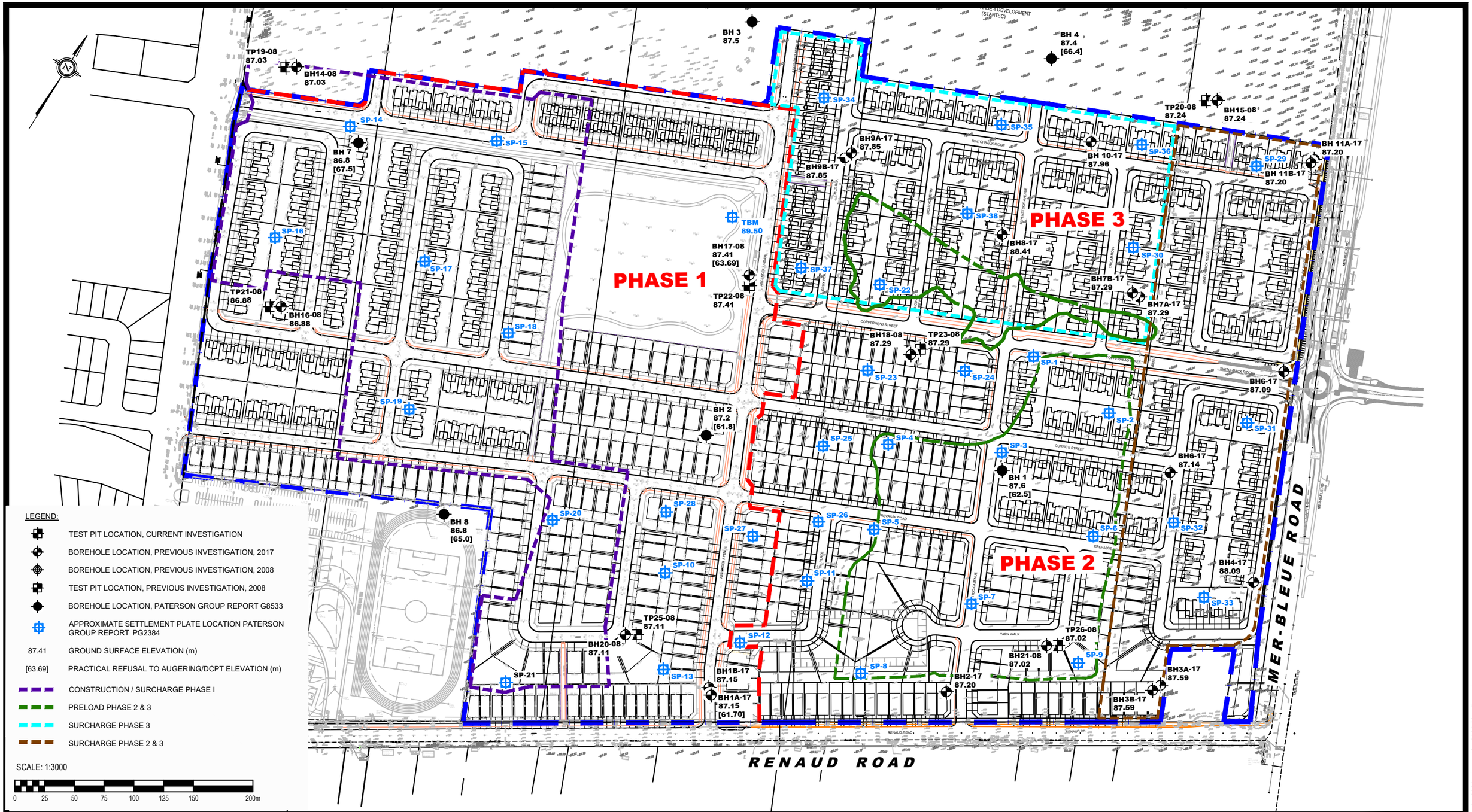


Figure 5 - Surcharge Monitoring Program - Phase 3
Trails Edge East - Proposed Residential Development - Renaud Road





LEGEND:

- TEST PIT LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, 2017
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, 2008
- TEST PIT LOCATION, PREVIOUS INVESTIGATION, 2008
- BOREHOLE LOCATION, PATERSON GROUP REPORT G8533
- APPROXIMATE SETTLEMENT PLATE LOCATION PATERSON GROUP REPORT PG2384
- 87.41 GROUND SURFACE ELEVATION (m)
- [63.69] PRACTICAL REFUSAL TO AUGERING/DCPT ELEVATION (m)
- CONSTRUCTION / SURCHARGE PHASE I
- PRELOAD PHASE 2 & 3
- SURCHARGE PHASE 3
- SURCHARGE PHASE 2 & 3

SCALE: 1:3000

0 25 50 75 100 125 150 200m

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consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
4	BASE PLAN UPDATED	07/29/21	OC
3	BASE PLAN UPDATED	08/02/19	NC
2	BASE PLAN UPDATED	08/08/18	DJG
1	UPDATED TEST HOLE LOCATION PLAN	7/26/18	NC

RICHCRAFT HOMES

GEOTECHNICAL INVESTIGATION
TRAILS EDGE EAST RESIDENTIAL DEVELOPMENT - RENAUD ROAD
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:3000	Date: 07/2018
Drawn by: MPG	Report No.: PG0861
Checked by: OC	Dwg. No.: PG0861-6
Approved by: DJG	Revision No.: 4

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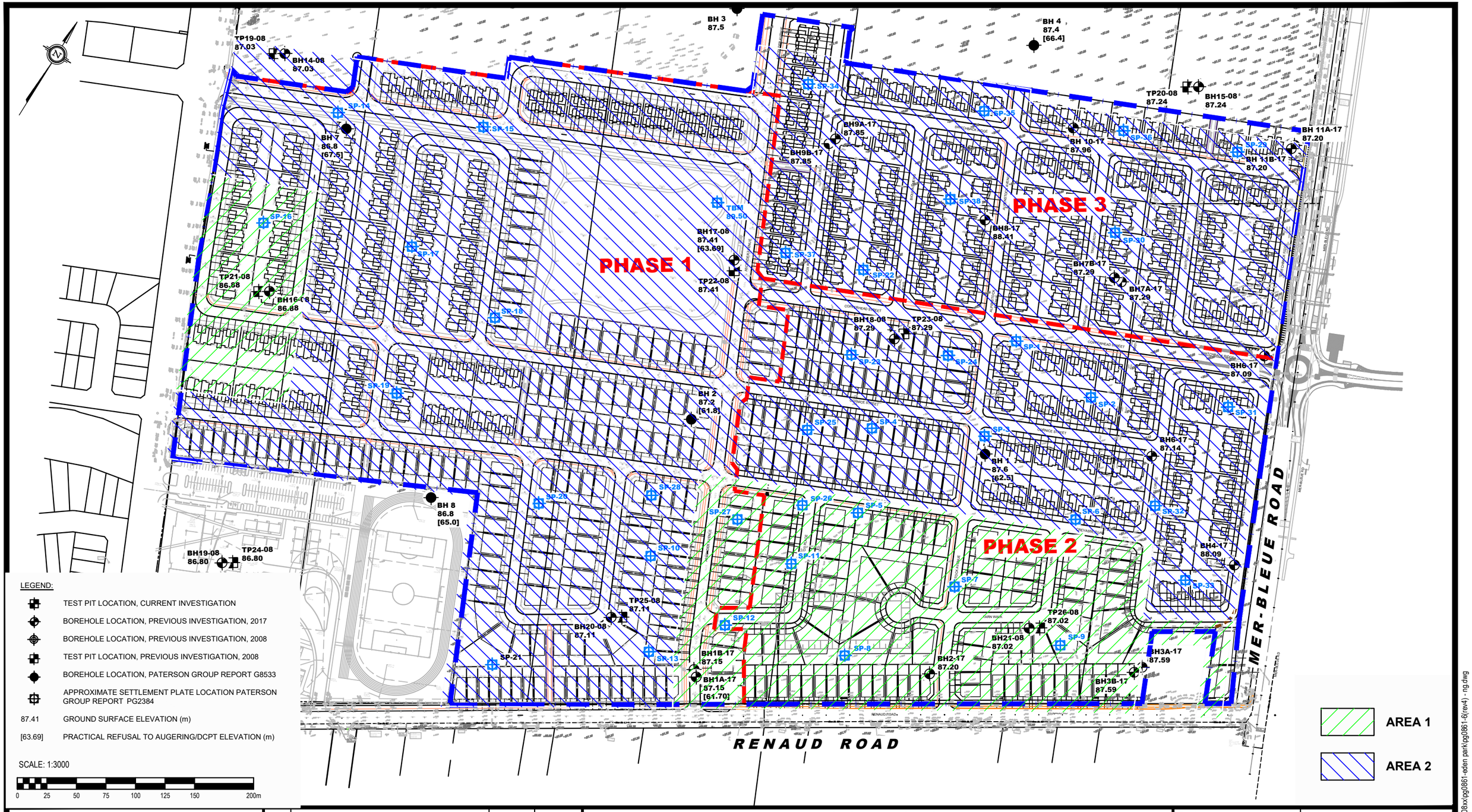

LEGEND:

- TEST PIT LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, 2017
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, 2008
- TEST PIT LOCATION, PREVIOUS INVESTIGATION, 2008
- BOREHOLE LOCATION, PATERSON GROUP REPORT G8533
- APPROXIMATE SETTLEMENT PLATE LOCATION PATERSON GROUP REPORT PG2384
- 87.41 GROUND SURFACE ELEVATION (m)
- [63.69] PRACTICAL REFUSAL TO AUGERING/DCPT ELEVATION (m)

SCALE: 1:3000

0 25 50 75 100 125 150 200m

patersongroup
consulting engineers

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NO.	REVISIONS	DATE	INITIAL
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3	BASE PLAN UPDATED	11/02/19	NC
2	BASE PLAN UPDATED	08/08/18	DJG
1	UPDATED TEST HOLE LOCATION PLAN	7/26/18	NC

RICHCRAFT HOMES

GEOTECHNICAL INVESTIGATION
TRAILS EDGE EAST RESIDENTIAL DEVELOPMENT - RENAUD ROAD
OTTAWA, ONTARIO

Title:
TREE PLANTING SETBACK RECOMMENDATIONS

Scale: 1:3000	Date: 07/2018
Drawn by: MPG	Report No.: PG0861
Checked by: OC	Dwg. No.: PG0861-7
Approved by: DJG	Revision No.: 4

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APPENDIX 3

DRAWING PG0861-15 – Stone Strong Retaining Wall Design SS1

DRAWING PG0861-16 – Stone Strong Retaining Wall Design SS2

DRAWING PG0861-17 – Stone Strong Retaining Wall Design SS3

PROFILE VIEW:

SCALE 1:150

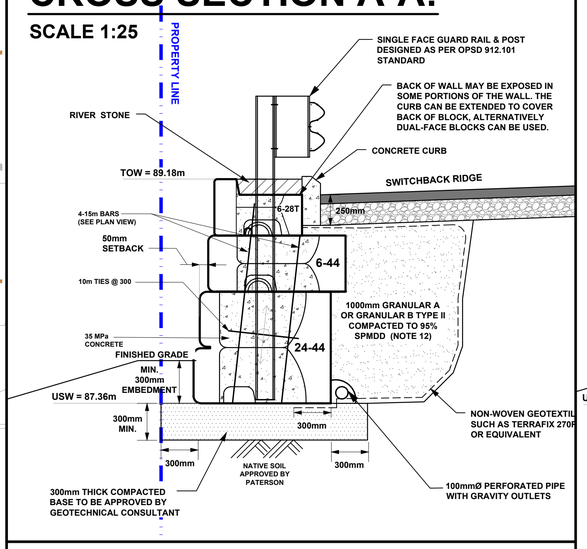
ISSUED FOR REVIEW

GRADING PLAN:

SCALE 1:750

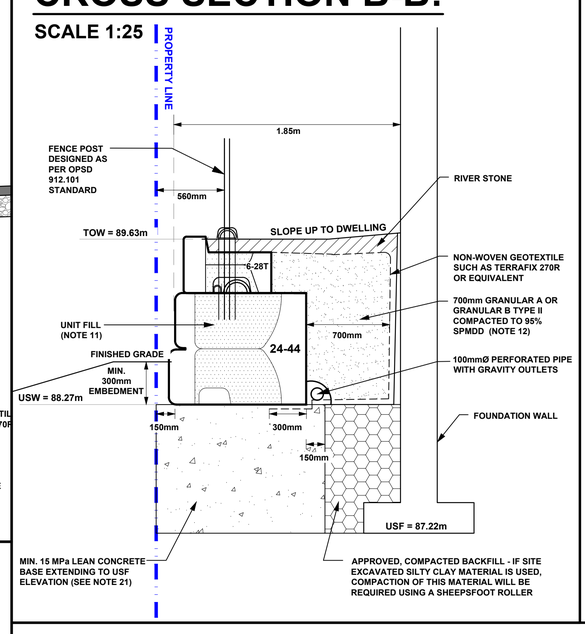
CROSS SECTION A-A:

SCALE 1:25



CROSS SECTION B-B:

SCALE 1:25



CATCH BASIN DETAIL

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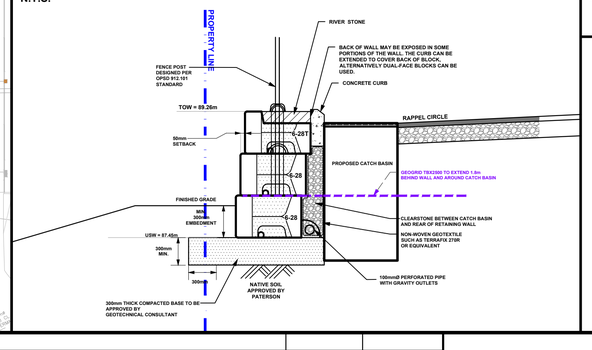

CORNER TIE BACK

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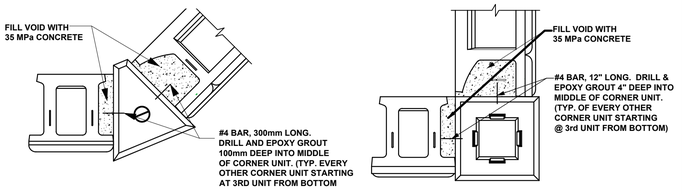


NOTES:

1. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR UTILITY CLEARANCE AND CONSTRUCTION SITE SAFETY. MCON PRODUCTS INC. AND PATERSON GROUP SHALL NOT BE RESPONSIBLE FOR MEANS OR METHODS OF CONSTRUCTION OR FOR SAFETY OF WORKERS OR OF THE PUBLIC.

2. THIS DESIGN IS BASED ON THE FOLLOWING SOIL PROPERTIES:

PROPERTY	RETAINED FILL	FOUNDATION MEDIUM
FRICTION ANGLE - PHI	36	28
UNIT WEIGHT - γ	22 KN/m3	20 KN/m3
COHESION - C	0	5 kPa
SOIL TYPE	GRANULAR B TYPE II & NATIVE FILL	STIFF SILTY CLAY

MATERIAL PROPERTIES ARE BASED ON SITE EVALUATION BY PATERSON GROUP, RETAINING WALL DESIGN AND SEISMIC LOADING WAS EVALUATED ACCORDING TO THE LATEST VERSION OF CHBDC, WITH A PEAK GROUND ACCELERATION VALUE OF 0.311. SURCHARGE AS PER CHBDC

2. THIS THE DESIGN ELEVATIONS USED WERE BASED ON A GRADING PLAN PROVIDED BY RICHCRAFT PREPARED BY STANTEC. THE WALL BASE DESIGN ASSUMES A BEARING RESISTANCE AT SLS OF 100 kPa ON VERY STIFF SILTY CLAY. PATERSON GROUP ENGINEER SHOULD OBSERVE THE BEARING CONDITIONS AND ADJUST THE THICKNESS OF THE GRANULAR BASE TO ACCOMMODATE THE SITE CONDITIONS, IF NECESSARY.

3. THE DESIGN HAS BEEN REVIEWED FOR THE STABILITY OF THE PRECAST MODULAR RETAINING WALL SYSTEM AND GLOBAL STABILITY WITH A FACTOR OF SAFETY OF 1.5 FOR STATIC CONDITIONS AND 1.1 UNDER SEISMIC CONDITIONS. WALL GEOMETRY AND GRADE ELEVATIONS ABOVE AND BELOW THE WALL SHOULD CONFORM WITH THE GRADING PLAN PROVIDED HEREIN. IF ACTUAL SITE GRADES VARY SIGNIFICANTLY FROM THOSE SHOWN OR IF THE BACK SLOPE DOES NOT CONFORM, INSTALLATION SHALL NOT PROCEED UNTIL THE DESIGN IS VERIFIED OR MODIFIED IN THE APPLICABLE AREA.

4. HORIZONTAL LAYOUT DIMENSIONS ARE MEASURED ALONG THE FACE OF THE WALL, CORRESPONDING TO A HORIZONTAL REFERENCE ESTABLISHED BY PATERSON GROUP BASED ON DRAWINGS BY DSEL.

5. PRECAST UNITS SHALL BE STONE STRONG RETAINING WALL UNITS MANUFACTURED UNDER LICENSE FROM STONE STRONG SYSTEMS. UNITS SHALL HAVE A MOLDED GRANITE FACE. THE BLOCKS MAY BE STAINED IN PLACE TO ACHIEVE THE DESIRED COLOR.

6. THE WALL BASE SHALL CONSIST OF A MINIMUM OF 300mm OF OPSS GRANULAR A OR GRANULAR B TYPE II. THE BASE SHALL BE COMPACTED AS TO PROVIDE A LEVEL AND HARD SURFACE ON WHICH TO PLACE THE FIRST COURSE OF UNITS. GRANULAR BASE MATERIAL SHALL BE COMPACTED TO A MINIMUM 98% OF STANDARD PROCTOR MAXIMUM DRY DENSITY (SPMDD). THE BASE SHALL BE SMOOTHED TO ENSURE COMPLETE CONTACT OF RETAINING WALL UNIT WITH BASE. SURFACE OF GRANULAR BASE MAY BE DRESSED WITH FINER AGGREGATE TO AID LEVELING. ENSURE GRADATION OF DRESSING MATERIAL IS SUCH AS TO PRECLUDE LOSS OF FINES INTO BASE. THE THICKNESS OF DRESSING LAYER SHOULD NOT EXCEED 3 TIMES THE MAXIMUM PARTICLE SIZE USED. THE CONTRACTOR MAY SUBSTITUTE CONCRETE WITH A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 20 MPa AND AIR ENTRAINMENT FOR THE GRANULAR BASE MATERIAL.

7. INSTALL 100mm DIAMETER PERFORATED PIPE DRAIN WRAPPED IN GEOTEXTILE AS SHOWN IN CROSS SECTION A-A (OR ALTERNATIVELY BEHIND HEEL OF WALL). PROVIDE CLEAR STONE SURROUNDING THE DRAIN TO PROTECT PIPE FROM CLOGGING AND DAMAGE. PROVIDE OUTLETS THROUGH WALL BASE LAYER AT LOW AREAS, NO FURTHER APART THAN 30m CENTRES.

8. PATERSON SHOULD REVIEW THE BEARING SURFACE DURING THE CONSTRUCTION. WHERE COMPACT SILTY SAND FILL MATERIAL IS ENCOUNTERED, PROOF ROLLING OF THE BEARING SURFACE WILL BE REQUIRED.

9. WALL IS DESIGNED FOR A MINIMUM OF 200 mm TOE EMBEDMENT WITH A MINIMUM HORIZONTAL LEDGE OF 300mm BEYOND THE FACE AND REAR OF BASE BLOCK. WHERE GRANULAR BEDDING WILL NOT BE SUFFICIENT, THE USE OF CONCRETE BEDDING MAY BE REQUIRED. EXTRA PRECAUTIONS MUST BE TAKEN TO PROVIDE TOE EMBEDMENT IN AREAS WHERE BASE OF WALL STEPS.

10. THE RETAINING WALL IS A BATTERED WALL. ALIGNMENT OF THE BOTTOM WALL UNIT COURSE SHOULD BE PLANNED TO CONSIDER THAT A NOMINAL 50 mm AUTOMATIC SETBACK WILL OCCUR WITH EACH 0.45 m HIGH UNIT.

11. UNIT FILL SHALL BE A CLEAN, COURSE GRANULAR MATERIAL. UNIT FILL SHALL BE 19mmØ CLEAR STONE MEETING THE SATISFACTION OF THE GEOTECHNICAL ENGINEER. UNIT FILL SHALL FILL CAVITIES WITHIN AND BETWEEN THE UNITS AND MAY EXTEND BEHIND THE FACING UNITS FOR THE CONTRACTOR'S CONVENIENCE.

12. BACKFILL MATERIAL SHALL BE APPROVED BY THE SITE GEOTECHNICAL ENGINEER PRIOR TO USE AND SHOULD CONSIST OF OPSS GRANULAR B TYPE II BUFFER OF 1000mm(AS SHOWN) WIDTH. ALL FILL WITHIN A 1H:1V ZONE UP AND BACK FROM THE HEEL SHOULD ALSO BE COMPACTED. BACKFILL SHALL BE PLACED IN MAXIMUM 300 mm LOOSE LIFTS AND COMPACTED TO A MINIMUM OF 95% OF THE MATERIAL'S SPMDD. MOISTURE CONTENT SHOULD BE CONTROLLED AND MAINTAINED WITHIN -3 TO +4 PERCENT OF OPTIMUM.

13. ENSURE EACH COARSE IS COMPLETELY FILLED AND BACKFILL IS PLACED TO THE SAME LEVEL PRIOR TO PROCEEDING TO THE NEXT COURSE. ENSURE ADJACENT UNITS ARE IN CONTACT SO THAT UNIT FILL MAY NOT ESCAPE THROUGH THE JOINT BETWEEN UNITS. GAPS GREATER THAN 6 mm BETWEEN UNITS (AT THE FACE) SHALL NOT BE ALLOWED. AT THE INTERSECTIONS WITH STRUCTURES, CUT UNITS TO OBTAIN A NEAT FIT. PULL BLOCK UNITS FORWARD TO ENGAGE THE ALIGNMENT LOOPS ON THE UNIT BELOW BEFORE INFILLING IN ALL CASES.

14. MAINTAIN TEMPORARY GRADES TO DIVERT SURFACE WATER AWAY FROM THE RETAINING WALL EXCAVATION. SLOPE FINAL BACKFILL TO PROVIDE POSITIVE DRAINAGE AND TO ELIMINATE PONDING.

15. IF WINTER CONSTRUCTION IS CONSIDERED, HEAT MUST BE MAINTAINED WHEN THE BASE IS EXPOSED. THE WALL BASE MUST BE COVERED WITH INSULATION TARPS TO MAINTAIN HEAT AND PROTECT THE BASE FROM POTENTIAL FROST HEAVE. ONCE THE BASE IS BACKFILLED, THE TOP OF WALL MUST BE COVERED WITH INSULATION TARPS OVERNIGHT UNTIL THE WALL CONSTRUCTION IS COMPLETED.

16. THE GEOTECHNICAL CONSULTANT SHOULD BE NOTIFIED AT THE BEGINNING OF THE WALL CONSTRUCTION TO COMPLETE PERIODIC INSPECTIONS AND PROVIDE GEOTECHNICAL RECOMMENDATIONS AS THE WALL CONSTRUCTION PROGRESSES.

17. DURING THE CONSTRUCTION OF THE RETAINING WALL, THE CONTRACTOR MUST ENSURE THAT A SAFE SLOPE IS PROVIDED BEHIND THE RETAINING WALL. THE GEOTECHNICAL CONSULTANT SHOULD COMPLETE PERIODIC INSPECTIONS TO ENSURE A PROPER SLOPE IS PROVIDED AS PER THE SITE GEOTECHNICAL RECOMMENDATIONS.

18. ANY INADEQUATE PERFORMING SUBGRADE SHOULD BE SUB-EXCAVATED AND REPLACED WITH OPSS GRANULAR B TYPE II, COMPACTED TO 98% OF THE MATERIALS SPMDD.

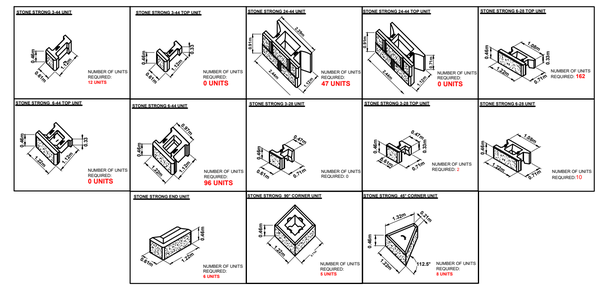
19. ANY CUTTING OF BLOCKS TO SUIT SITE CONDITIONS OR WALL DESIGN WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. REMOVAL/CUTTING OF LIFTING LOOPS ON THE FINAL ROW OF BLOCKS WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.

20. SECTIONS OF THE RETAINING WALL IN CLOSE PROXIMITY TO THE PAVEMENT STRUCTURE SHOULD BE SUBJECTED TO A SEALANT AGAINST SALT. SPRAY SHOULD BE APPLIED UPON COMPLETION OF THE RETAINING WALL CONSTRUCTION TO THE WALL FACE WHERE THE WALL IS DIRECTLY ADJACENT TO THE NEARBY ROADS.
SEALANT SHOULD CONSIST OF A WATER BASED SILANE PENETRATING SEALANT, SUCH AS MASTERPROTECT H-400 OR EQUIVALENT, RECOMMENDED TO BE USED POST INSTALLATION OF THE RETAINING WALL SYSTEM. THE METHOD CONSISTS OF PRESSURE WASHING THE WALL BLOCKS AND APPLYING THE SEALANT. THE PROCESS SHOULD BE REPEATED EVERY 5 YEARS.

21. WHERE THE RETAINING WALL IS PLACED IN CLOSE PROXIMITY TO A PROPOSED DWELLING, THE WALL BASE SHOULD CONSIST OF 15 MPa LEAN CONCRETE TO MATCH THE UNDERSIDE OF FOOTING AND EXTEND A MINIMUM OF 150mm IN FRONT AND BEHIND THE BASE BLOCK. ALTERNATIVELY A SUPPLEMENTAL 24-44 BLOCK CAN BE FULLY BURRIED TO LOWER THE BASE OF THE WALL TO MATCH THE UNDERSIDE OF FOOTING ELEVATION. THE BLOCKS SHOULD BE STAGGERED.

BLOCK COUNT:

N.T.S.



patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
3	REVISED AS PER CITY COMMENTS	12/08/2022	SD
2	AS PER REVISED GRADING PLAN	22/06/2022	SD
1	AS PER REVISED GRADING PLAN	14/06/2022	SD

RICHCRAFT HOMES

PROPOSED RETAINING WALLS
TRAILS EDGE EAST RESIDENTIAL DEVELOPMENT - RENAUD ROAD
OTTAWA, ONTARIO

Title:

STONE STRONG RETAINING WALL DESIGN (SS1)

Stamp: LICENSED PROFESSIONAL ENGINEER 12/08/2022 J. R. VILLENEUVE 100094514 PROVINCE OF ONTARIO

Stamp: LICENSED PROFESSIONAL ENGINEER 12/08/2022 S. S. DENNIS 100519516 PROVINCE OF ONTARIO

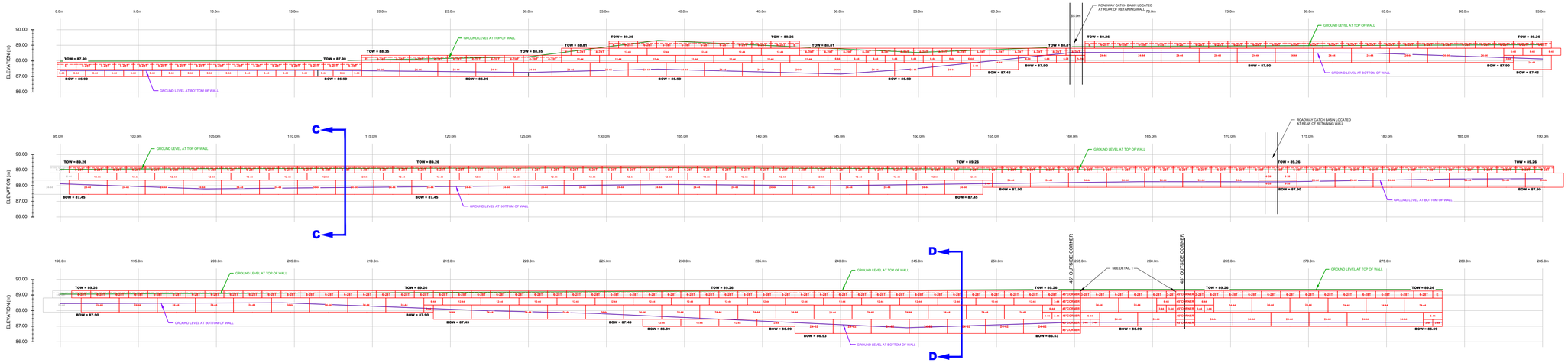
Scale:	AS SHOWN
Drawn by:	NFRV
Checked by:	JV
Approved by:	FA
Date:	11/2021
File No.:	PG0861
Drawing No.:	PG0861-15
Revision No.:	3

j:\autocad\drawings\geotechnical\pg0xxx\pg0861-eden park\retaining wall nov 2021\dwg\pg0861-stone strong rev3.dwg

PROFILE VIEW:

SCALE 1:150

ISSUED FOR REVIEW



DETAIL 1:

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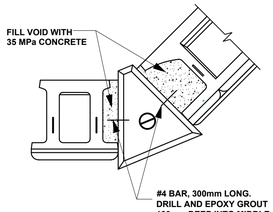
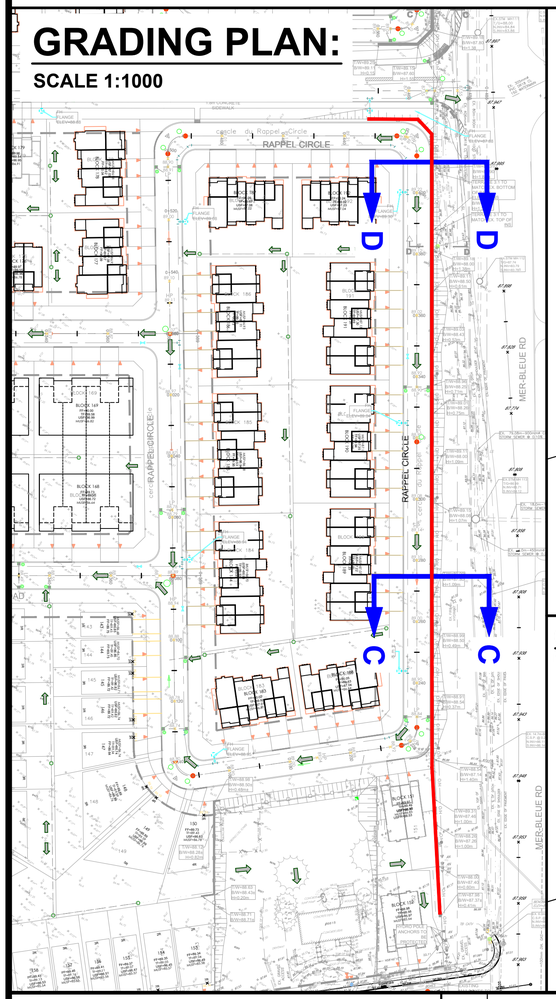


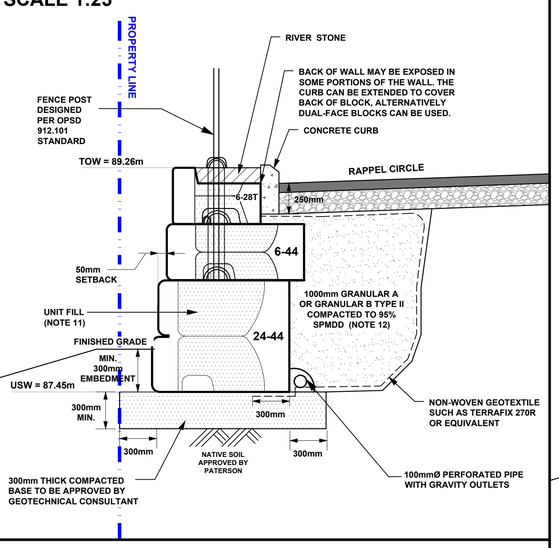
GRADING PLAN:

SCALE 1:1000



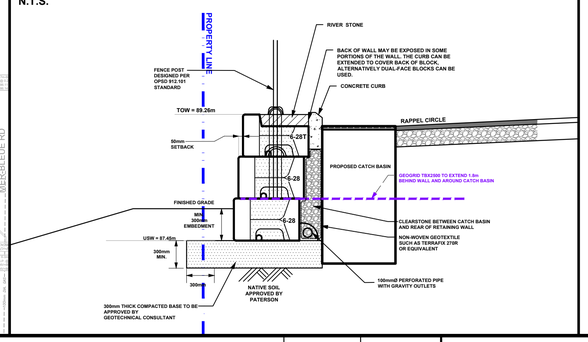
CROSS SECTION C-C:

SCALE 1:25



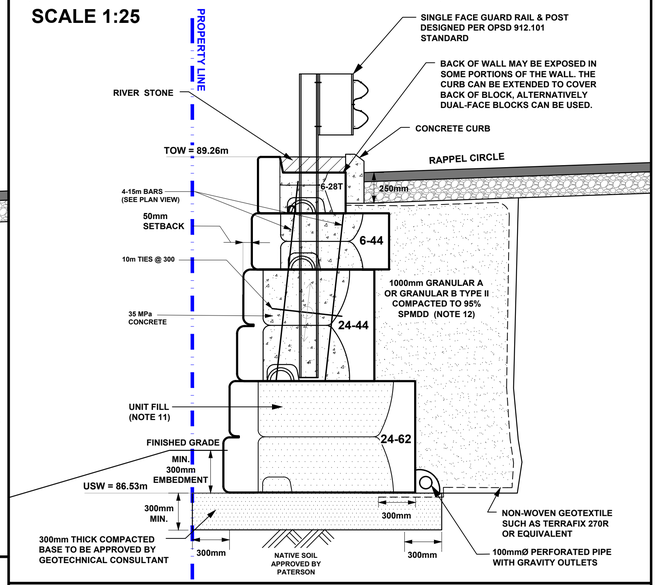
CATCH BASIN DETAIL

N.T.S.



CROSS SECTION D-D:

SCALE 1:25



BLOCK COUNT:

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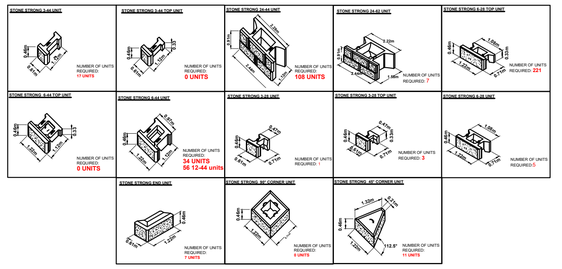

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COHESION - C	0	5 kPa
SOIL TYPE	GRANULAR B TYPE II & NATIVE FILL	STIFF SILTY CLAY

MATERIAL PROPERTIES ARE BASED ON SITE EVALUATION BY PATERSON GROUP, RETAINING WALL DESIGN AND SEISMIC LOADING WAS EVALUATED ACCORDING TO THE LATEST VERSION OF CHBDC, WITH A PEAK GROUND ACCELERATION VALUE OF 0.311. SURCHARGE AS PER CHBDC

2. THIS THE DESIGN ELEVATIONS USED WERE BASED ON A GRADING PLAN PROVIDED BY RICHCRAFT PREPARED BY STANTEC. THE WALL BASE DESIGN ASSUMES A BEARING RESISTANCE AT SLS OF 100 kPa ON VERY STIFF SILTY CLAY. PATERSON GROUP ENGINEER SHOULD OBSERVE THE BEARING CONDITIONS AND ADJUST THE THICKNESS OF THE GRANULAR BASE TO ACCOMMODATE THE SITE CONDITIONS, IF NECESSARY.

3. THE DESIGN HAS BEEN REVIEWED FOR THE STABILITY OF THE PRECAST MODULAR RETAINING WALL SYSTEM AND GLOBAL STABILITY WITH A FACTOR OF SAFETY OF 1.5 FOR STATIC CONDITIONS AND 1.1 UNDER SEISMIC CONDITIONS. WALL GEOMETRY AND GRADE ELEVATIONS ABOVE AND BELOW THE WALL SHOULD CONFORM WITH THE GRADING PLAN PROVIDED HEREIN. IF ACTUAL SITE GRADES VARY SIGNIFICANTLY FROM THOSE SHOWN OR IF THE BACK SLOPE DOES NOT CONFORM, INSTALLATION SHALL NOT PROCEED UNTIL THE DESIGN IS VERIFIED OR MODIFIED IN THE APPLICABLE AREA.

4. HORIZONTAL LAYOUT DIMENSIONS ARE MEASURED ALONG THE FACE OF THE WALL, CORRESPONDING TO A HORIZONTAL REFERENCE ESTABLISHED BY PATERSON GROUP BASED ON DRAWINGS BY DSEL.

5. PRECAST UNITS SHALL BE STONE STRONG RETAINING WALL UNITS MANUFACTURED UNDER LICENSE FROM STONE STRONG SYSTEMS. UNITS SHALL HAVE A MOLDED GRANITE FACE. THE BLOCKS MAY BE STAINED IN PLACE TO ACHIEVE THE DESIRED COLOR.

6. THE WALL BASE SHALL CONSIST OF A MINIMUM OF 300mm OF OPSS GRANULAR A OR GRANULAR B TYPE II. THE BASE SHALL BE COMPACTED AS TO PROVIDE A LEVEL AND HARD SURFACE ON WHICH TO PLACE THE FIRST COURSE OF UNITS. GRANULAR BASE MATERIAL SHALL BE COMPACTED TO A MINIMUM 98% OF STANDARD PROCTOR MAXIMUM DRY DENSITY (SPMDD). THE BASE SHALL BE SMOOTHED TO ENSURE COMPLETE CONTACT OF RETAINING WALL UNIT WITH BASE. SURFACE OF GRANULAR BASE MAY BE DRESSED WITH FINER AGGREGATE TO AID LEVELING. ENSURE GRADATION OF DRESSING MATERIAL IS SUCH AS TO PRECLUDE LOSS OF FINES INTO BASE. THE THICKNESS OF DRESSING LAYER SHOULD NOT EXCEED 3 TIMES THE MAXIMUM PARTICLE SIZE USED. THE CONTRACTOR MAY SUBSTITUTE CONCRETE WITH A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 20 MPa AND AIR ENTRAINMENT FOR THE GRANULAR BASE MATERIAL.

7. INSTALL 100mm DIAMETER PERFORATED PIPE DRAIN WRAPPED IN GEOTEXTILE AS SHOWN IN CROSS SECTION A-A (OR ALTERNATIVELY BEHIND HEEL OF WALL). PROVIDE CLEAR STONE SURROUNDING THE DRAIN TO PROTECT PIPE FROM CLOGGING AND DAMAGE. PROVIDE OUTLETS THROUGH WALL BASE LAYER AT LOW AREAS, NO FURTHER APART THAN 30m CENTRES.

8. PATERSON SHOULD REVIEW THE BEARING SURFACE DURING THE CONSTRUCTION. WHERE COMPACT SILTY SAND FILL MATERIAL IS ENCOUNTERED, PROOF ROLLING OF THE BEARING SURFACE WILL BE REQUIRED.

9. WALL IS DESIGNED FOR A MINIMUM OF 200 mm TOE EMBEDMENT WITH A MINIMUM HORIZONTAL LEDGE OF 300mm BEYOND THE FACE AND REAR OF BASE BLOCK WHERE GRANULAR BEDDING WILL NOT BE SUFFICIENT, THE USE OF CONCRETE BEDDING MAY BE REQUIRED. EXTRA PRECAUTIONS MUST BE TAKEN TO PROVIDE TOE EMBEDMENT IN AREAS WHERE BASE OF WALL STEPS.

10. THE RETAINING WALL IS A BATTERED WALL. ALIGNMENT OF THE BOTTOM WALL UNIT COURSE SHOULD BE PLANNED TO CONSIDER THAT A NOMINAL 50 mm AUTOMATIC SETBACK WILL OCCUR WITH EACH 0.45 m HIGH UNIT.

11. UNIT FILL SHALL BE A CLEAN, COURSE GRANULAR MATERIAL. UNIT FILL SHALL BE 19mmØ CLEAR STONE MEETING THE SATISFACTION OF THE GEOTECHNICAL ENGINEER. UNIT FILL SHALL FILL CAVITIES WITHIN AND BETWEEN THE UNITS AND MAY EXTEND BEHIND THE FACING UNITS FOR THE CONTRACTOR'S CONVENIENCE.

12. BACKFILL MATERIAL SHALL BE APPROVED BY THE SITE GEOTECHNICAL ENGINEER PRIOR TO USE AND SHOULD CONSIST OF OPSS GRANULAR B TYPE II BUFFER OF 1000mm(AS SHOWN) WIDTH. ALL FILL WITHIN A 1H:1V ZONE UP AND BACK FROM THE HEEL SHOULD ALSO BE COMPACTED. BACKFILL SHALL BE PLACED IN MAXIMUM 300 mm LOOSE LIFTS AND COMPACTED TO A MINIMUM OF 95% OF THE MATERIAL'S SPMDD. MOISTURE CONTENT SHOULD BE CONTROLLED AND MAINTAINED WITHIN -3 TO +4 PERCENT OF OPTIMUM.

13. ENSURE EACH COARSE IS COMPLETELY FILLED AND BACKFILL IS PLACED TO THE SAME LEVEL PRIOR TO PROCEEDING TO THE NEXT COURSE. ENSURE ADJACENT UNITS ARE IN CONTACT SO THAT UNIT FILL MAY NOT ESCAPE THROUGH THE JOINT BETWEEN UNITS. GAPS GREATER THAN 6 mm BETWEEN UNITS (AT THE FACE) SHALL NOT BE ALLOWED. AT THE INTERSECTIONS WITH STRUCTURES, CUT UNITS TO OBTAIN A NEAT FIT. PULL BLOCK UNITS FORWARD TO ENGAGE THE ALIGNMENT LOOPS ON THE UNIT BELOW BEFORE INFILLING IN ALL CASES.

14. MAINTAIN TEMPORARY GRADES TO DIVERT SURFACE WATER AWAY FROM THE RETAINING WALL EXCAVATION. SLOPE FINAL BACKFILL TO PROVIDE POSITIVE DRAINAGE AND TO ELIMINATE PONDING.

15. IF WINTER CONSTRUCTION IS CONSIDERED, HEAT MUST BE MAINTAINED WHEN THE BASE IS EXPOSED. THE WALL BASE MUST BE COVERED WITH INSULATION TARPS TO MAINTAIN HEAT AND PROTECT THE BASE FROM POTENTIAL FROST HEAVE. ONCE THE BASE IS BACKFILLED, THE TOP OF WALL MUST BE COVERED WITH INSULATION TARPS OVERNIGHT UNTIL THE WALL CONSTRUCTION IS COMPLETED.

16. THE GEOTECHNICAL CONSULTANT SHOULD BE NOTIFIED AT THE BEGINNING OF THE WALL CONSTRUCTION TO COMPLETE PERIODIC INSPECTIONS AND PROVIDE GEOTECHNICAL RECOMMENDATIONS AS THE WALL CONSTRUCTION PROGRESSES.

17. DURING THE CONSTRUCTION OF THE RETAINING WALL, THE CONTRACTOR MUST ENSURE THAT A SAFE SLOPE IS PROVIDED BEHIND THE RETAINING WALL. THE GEOTECHNICAL CONSULTANT SHOULD COMPLETE PERIODIC INSPECTIONS TO ENSURE A PROPER SLOPE IS PROVIDED AS PER THE SITE GEOTECHNICAL RECOMMENDATIONS.

18. ANY INADEQUATE PERFORMING SUBGRADE SHOULD BE SUB-EXCAVATED AND REPLACED WITH OPSS GRANULAR B TYPE II, COMPACTED TO 98% OF THE MATERIALS SPMDD.

19. ANY CUTTING OF BLOCKS TO SUIT SITE CONDITIONS OR WALL DESIGN WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. REMOVAL/CUTTING OF LIFTING LOOPS ON THE FINAL ROW OF BLOCKS WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.

20. SECTIONS OF THE RETAINING WALL IN CLOSE PROXIMITY TO THE PAVEMENT STRUCTURE SHOULD BE SUBJECTED TO A SEALANT AGAINST SALT. SPRAY SHOULD BE APPLIED UPON COMPLETION OF THE RETAINING WALL CONSTRUCTION TO THE WALL FACE WHERE THE ROAD IS DIRECTLY ADJACENT TO THE NEARBY ROADS.
SEALANT SHOULD CONSIST OF A WATER BASED SILANE PENETRATING SEALANT, SUCH AS MASTERPROTECT H-400 OR EQUIVALENT, RECOMMENDED TO BE USED DURING OR POST INSTALLATION OF THE RETAINING WALL SYSTEM. THE METHOD CONSISTS OF PRESSURE WASHING THE WALL BLOCKS AND APPLYING THE SEALANT. THE PROCESS SHOULD BE REPEATED EVERY 5 YEARS.

21. WHERE THE RETAINING WALL IS PLACED IN CLOSE PROXIMITY TO A PROPOSED DWELLING, THE WALL BASE SHOULD CONSIST OF 15 MPa LEAN CONCRETE TO MATCH THE UNDERSIDE OF FOOTING AND EXTEND A MINIMUM OF 150mm IN FRONT AND BEHIND THE BASE BLOCK. ALTERNATIVELY A SUPPLEMENTAL 24-44 BLOCK CAN BE FULLY BURRIED TO LOWER THE BASE OF THE WALL TO MATCH THE UNDERSIDE OF FOOTING ELEVATION. THE BLOCKS SHOULD BE STAGGERED.

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NO.	REVISIONS	DATE	INITIAL
3	REVISED AS PER CITY COMMENTS	12/08/2022	SD
2	AS PER REVISED GRADING PLAN	22/06/2022	SD
1	AS PER REVISED GRADING PLAN	14/06/2022	SD

RICHCRAFT HOMES

PROPOSED RETAINING WALLS
TRAILS EDGE EAST RESIDENTIAL DEVELOPMENT - RENAUD ROAD
OTTAWA, ONTARIO

Title:

STONE STRONG RETAINING WALL DESIGN (SS2)

Stamp: LICENSED PROFESSIONAL ENGINEER 12/08/2022 J. R. VILLENEUVE 100504314 PROVINCE OF ONTARIO

Stamp: LICENSED PROFESSIONAL ENGINEER 12/08/2022 S. S. DENNIS 100519516 PROVINCE OF ONTARIO

Scale: AS SHOWN	File No.: PG0861
Drawn by: NFRV	Drawing No.: PG0861-16
Checked by: JV	
Approved by: FA	
Date: 11/2021	Revision No.: 3

ISSUED FOR REVIEW

PROFILE VIEW:

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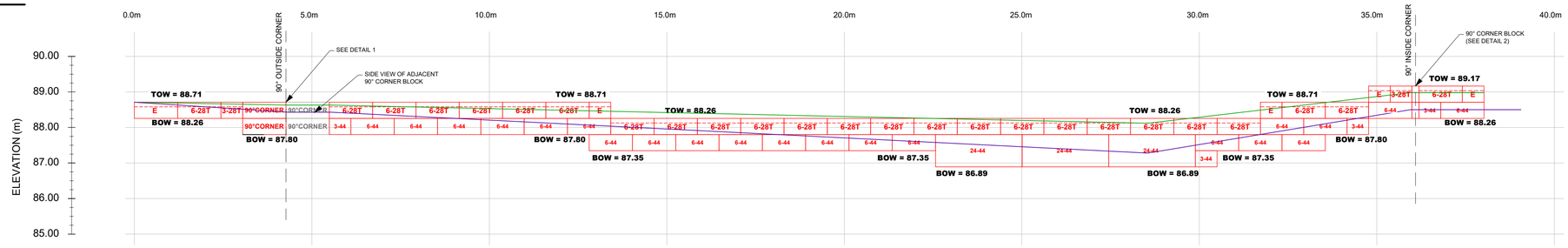
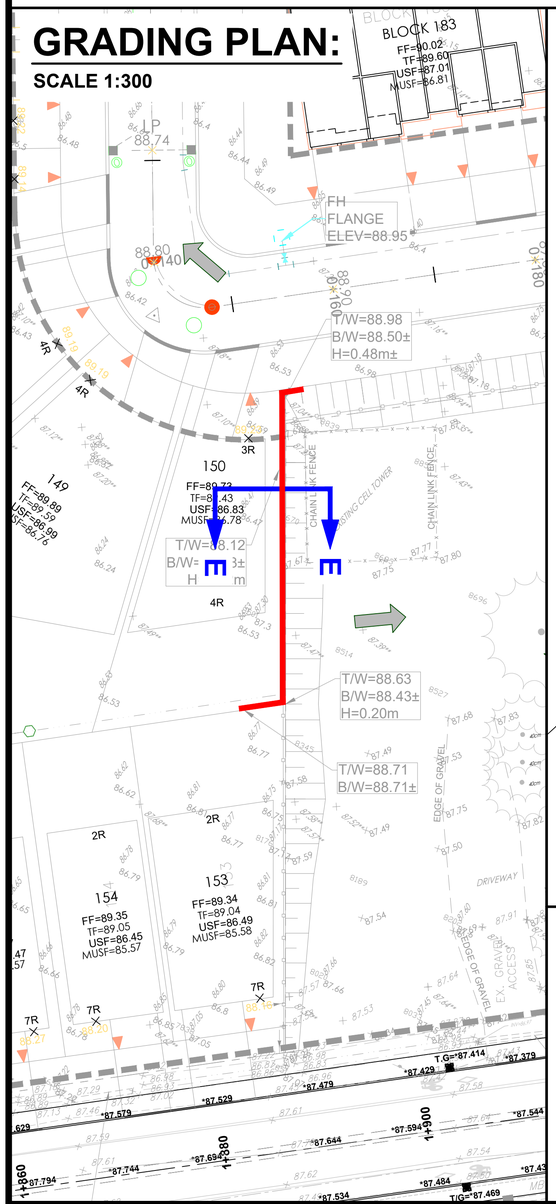


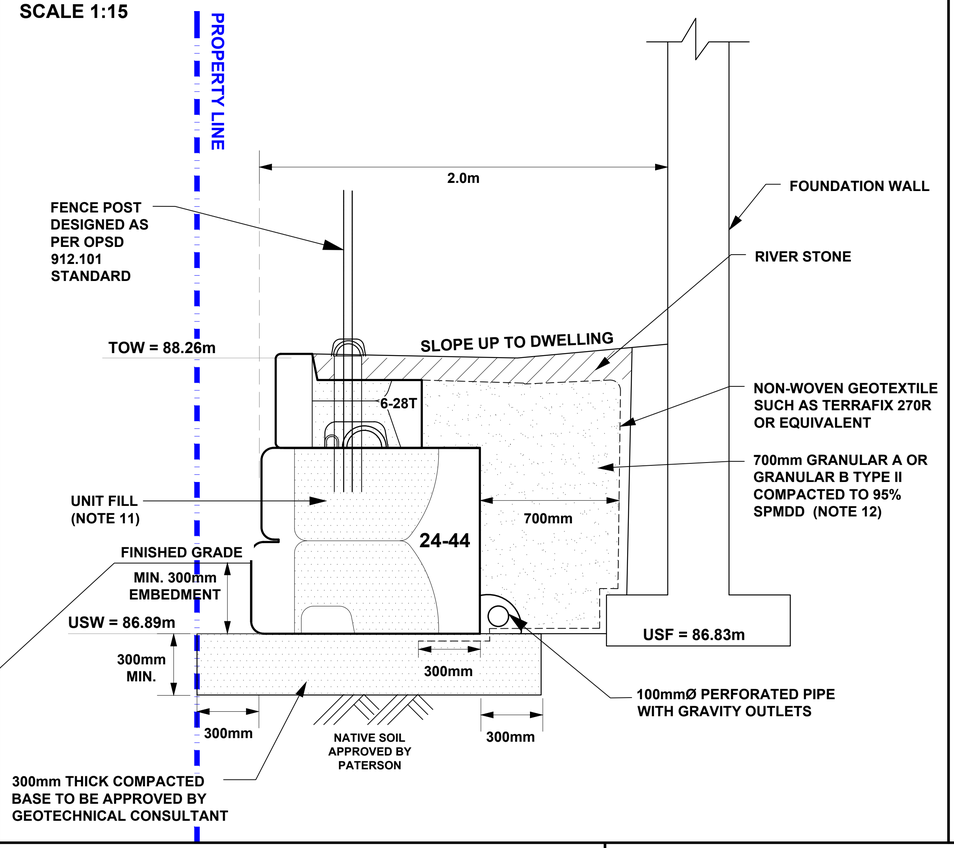
GRADING PLAN:

SCALE 1:300



CROSS SECTION E-E:

SCALE 1:15



BLOCK COUNT:

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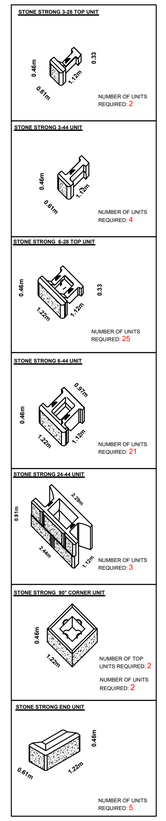

NOTES:

1. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR UTILITY CLEARANCE AND CONSTRUCTION SITE SAFETY. MCON PRODUCTS INC. AND PATERSON GROUP SHALL NOT BE RESPONSIBLE FOR MEANS OR METHODS OF CONSTRUCTION OR FOR SAFETY OF WORKERS OR OF THE PUBLIC.

2. THIS DESIGN IS BASED ON THE FOLLOWING SOIL PROPERTIES:

PROPERTY	RETAINED FILL	FOUNDATION MEDIUM
FRICTION ANGLE - PHI	36	28
UNIT WEIGHT - γ	22 KN/m3	20 KN/m3
COHESION - C	0	5 kPa
SOIL TYPE	GRANULAR B TYPE II & NATIVE FILL	STIFF SILTY CLAY

MATERIAL PROPERTIES ARE BASED ON SITE EVALUATION BY PATERSON GROUP, RETAINING WALL AND SEISMIC LOADING WAS EVALUATED ACCORDING TO THE LATEST VERSION OF CHBDC, WITH A PEAK GROUND ACCELERATION VALUE OF 0.311. SURCHARGE AS PER CHBDC

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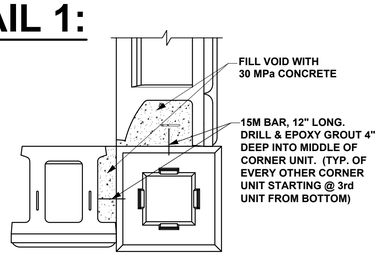
DETAIL 1:

N.T.S.



DETAIL 2:

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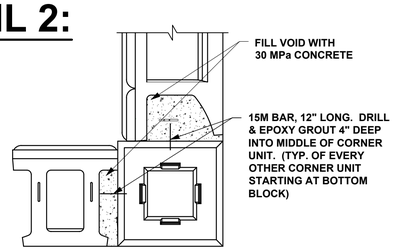

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RICHCRAFT HOMES

PROPOSED RETAINING WALLS
TRAILS EDGE EAST RESIDENTIAL DEVELOPMENT - RENAUD ROAD
OTTAWA, ONTARIO

Title:

STONE STRONG RETAINING WALL DESIGN (SS3)

Stamp: LICENSED PROFESSIONAL ENGINEER 12/08/2022 J. R. VILLENEUVE 100904514 PROVINCE OF ONTARIO

Stamp: LICENSED PROFESSIONAL ENGINEER 12/08/2022 S. S. DENNIS 100519516 PROVINCE OF ONTARIO

Scale:	AS SHOWN
Drawn by:	NFRV
Checked by:	JV
Approved by:	FA
Date:	11/2021
File No.:	PG0861
Drawing No.:	PG0861-17
Revision No.:	3

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